A STUDY OF LIGHT IN THE MAIN STAIRCASES OF THE MACKINTOSH & REID BUILDINGS AT THE GLASGOW SCHOOL OF ART

TAKUMI SANADA

CONTENTS

INTRODUCTION

" We were born of light. The seasons are felt through light. We only know the world as it is evoked by light ... Natural light is the only light that makes architecture architecture[1]." (Louis Kahn)

I believe that light is one of the most important factors for all architectural space. I am interested in what kind of light change space in certain ways and what are the effects which light gives to people.

In this dissertation, I will explore the quality of light of the two Glasgow School of Art buildings designed by Charles Rennie Mackintosh and Steven Holl. What is the difference of the quality of the light designed by Mackintosh and Steven Holl? The building designed by Charles Rennie Mackintosh (Mackintosh building) and the building designed by Steven Holl (Reid building) have a time gap of 100 years and the features of their space are a quite contrast in terms of its structure and materials. Mackintosh building's structure and materiality are steel, wood, and stone, while those of Reid building are reinforced concrete and glass.

"The diagram illustrates the theme of complimentary contrast both in structure and materiality between the existing Mackintosh building and the proposed new building for Phase1. (fig. 0.1) The idea of contrast being complimentary is critical to the idea of a new modern building relating to an existing building, without apeing it and becoming practiche[2]." (Steven Holl)

---

[1] Henry Plummer, Poetics of Light (Tokyo, a + u Publishing, 1987), 135
[2] Steven Holl Architects, The Glasgow School of Art Design Statement (2010), 94

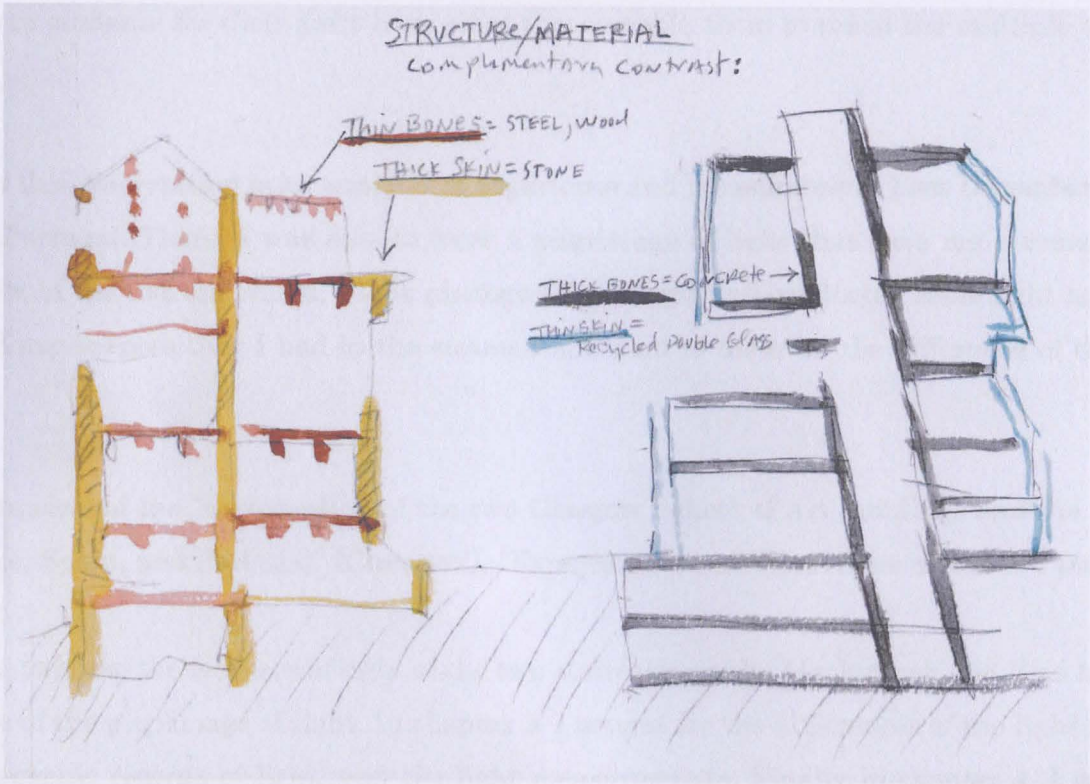


fig. 0.1 The contrast of the structure and materiality of the two buildings[3]

[3] Steven Holl Architects, The Glasgow School of Art Design Statement (2010), 94

In this dissertation, I will examine the difference of the quality of light of the two buildings' staircases designed by Mackintosh and Steven Holl. Both staircases are located at the center of the buildings and are considered as the feature of the buildings. These staircases are indispensable to students for their daily lives since these enable them to reach the multiple stories that comprise the two buildings.

The methodology of this dissertation is an analysis of experience and measurement. Last December 2013, I visited architectural sites in France, Spain, and Portugal. There, I was able to have a pilgrimage of light that gave me a remarkable experience. To better examine and analyze the light of the two staircases, I took photographs of light and conducted some light measurements. Through these experiments and the several experiences that I had in the staircases, I tried to discover the difference of the quality of light of the two staircases.

This dissertation consists of the "Introduction of the two Glasgow School of Art buildings and the main staircases" (Chapter1), "Pilgrimage of light in France, Spain, and Portugal" (Chapter2), "Experiments and discoveries in the two staircases" (Chapter3), and the "Conclusion" (Chapter4).

In chapter 2, I tried to grasp the features of light of the two staircases in the Mackintosh and Reid buildings from the viewpoints acquired from the experience of the pilgrimage of light. In chapter 3, I sought for the differences of the light of the two staircases through the observations, the photographic records of light, and the light measurements. Finally in chapter 4, I stated the conclusion and my interpretation about the differences of light of the quality of the two staircases.

CHAPTER 1 _ THE TWO GLASGOW SCHOOL OF ART BUILDINGS AND THE MAIN STAIRCASES

1.1 THE TWO GLASGOW SCHOOL OF ART BUILDINGS

The two Glasgow School of Art buildings, namely Mackintosh building and Reid building, are located at Renfrew Street in the center of Glasgow. Both buildings are designed carefully in order to respond to and make the best of the bad condition of the site, where there is "the grey dull atmosphere prevailing here (Glasgow) for half the year[4]", especially in terms of the design of light due to its climate and low solstice sun angle (summer sun; 58 degrees / winter sun; 11 degrees).

fig. 1.1 Two Glasgow School of Art buildings at Renfrew Street

fig. 1.2 low solstice sun angle in Glasgow

[4] William Buchanan, Mackintosh's Masterwork the Glasgow School of Art (Edinburgh, GSA Enterprises Limited, 1994), 13

1.2 MACKINTOSH BUILDING

In January 1897, Charles Rennie Mackintosh was announced as the appointed architect to design the new Glasgow School of Art building at Renfrew Street by the Glasgow practice of Honeyman and Keppie. The Construction began later that year and the first stage was completed in 1899. In 1904, Mackintosh became a partner in Honeyman and Keppie and work on the Art School that was recommenced in 1907 and was completed in 1909[5].

As the features of light of the Mackintosh building, the studios are lit by the unchanging light from the huge north-facing windows. The circulation through the building takes one through diverse and ever changing lights. The south-facing slope of glass also allows direct sunlight to penetrate deep into the building. On the second floor, the circulation is a loggia and it captures the ever-changing light and the weather of this north-western city. And the important public rooms have individual qualities through their lighting. These public rooms include the entry where is lit by light from the wholly glassed roof of the museum above, and the library where is lit by three deeply incised windows in the south wall[6].

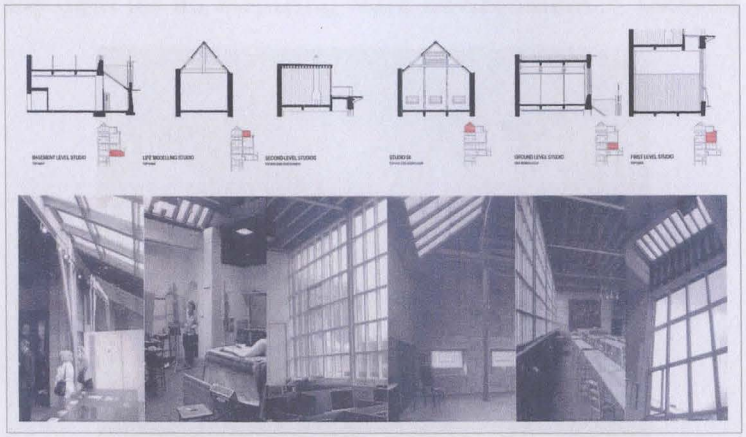


fig. 1.3 Various types of light in the Mackintosh building[7]

[5] Taylor and Francis, The Environmental Imagination (Wiltshire, The Cromwell Press, 2008), 19
[6] Ibid, p19-p21
[7] Steven Holl Architects, The Glasgow School of Art Design Statement (2010), 32

1.3 REID BUILDING

In January 2009, the Scottish Funding Council approved the outline business case for phase 1 of the school's estate strategy that aims at the improvement of the condition of the Garnethill campus. Through the competition, Steven Holl Architects was recommended as the design team leader in September 2009, and the construction of Reid building was completed in December 2013.

In terms of light of Reid building, studios are positioned on the northern facade provided with the desirable high quality diffuse north light. Spaces that do not have a requirement for the same quality of natural luminance, such as the refectory and offices, are positioned at the southern elevation where access to sunlight can be balanced. And the main feature is the three shafts, termed 'driven voids of light', which deliver natural light deep within the building structure providing direct connectivity with the outside world through changing intensity and color of the sky. It seems that these features are based on the light of the Mackintosh building. [8]

"Mackintosh's amazing manipulation of the building for light in such a variety of inventive ways has inspired our approach toward a plan of volumes in different light. ... Learning from the Mackintosh, we see the studio/workshop as the basic building block of the building, arranged with natural side and top light for an inspiring work environment. [9]" (Steven Holl)

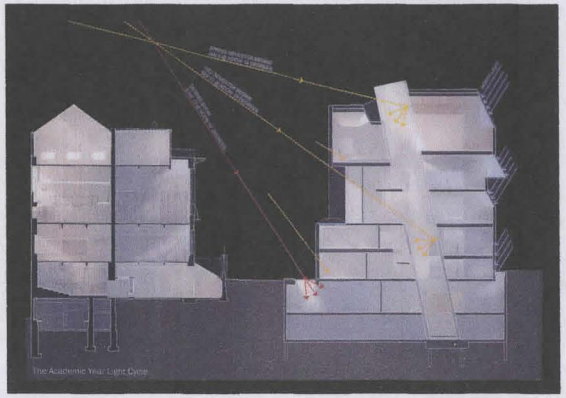


fig. 1.4 The 'Driven Void' light shafts deliver natural light (The Academic Year Light Cycle)[9]

[8] Steven Holl Architects, The Glasgow School of Art Design Statement (2010), 94
[9] Ibid, 102

1.4 THE STAIRCASE OF MACKINTOSH BUILDING

In Mackintosh building, the central staircase (the main staircase in Mackintosh building) connects the ground floor with the first floor, and also connects the ground floor with the basement. (The each floor plan is on page 8 and page 9.) The space is lit by upper light from the roof light of the museum on the first floor. (fig. 1.5) The planar shape of the staircase of each floor is almost same and is arranged at same position in every floor. They are overlapping when seen from the upper floor. (fig. 1.6) The floor and wall of the part of the stairs from the basement to the ground floor are made of stone, and those of the stairs from the ground floor to the first floor are made of timber. (fig. 1.7 , fig. 1.8) With regards to the design of the handrails that is similar to Japanese style "Sukashi" and Japanese-like beam construction, Mackintosh seems to be influenced by the Japanese culture since the industry of Glasgow used to have the relationship with Japan, particularly in shipbuilding in the 19th century.[10]

"Mackintosh also knew about the art of Japan. ... An occasional, exotic, whiff of Japan pervades the School.[11]"

fig. 1.5 light from roof light

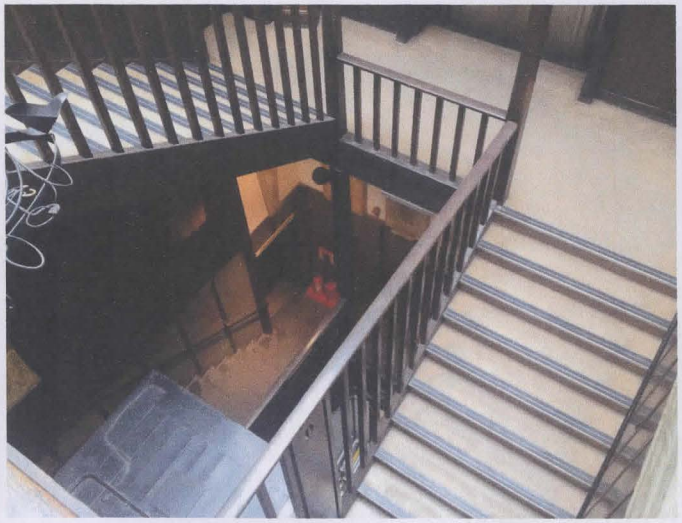
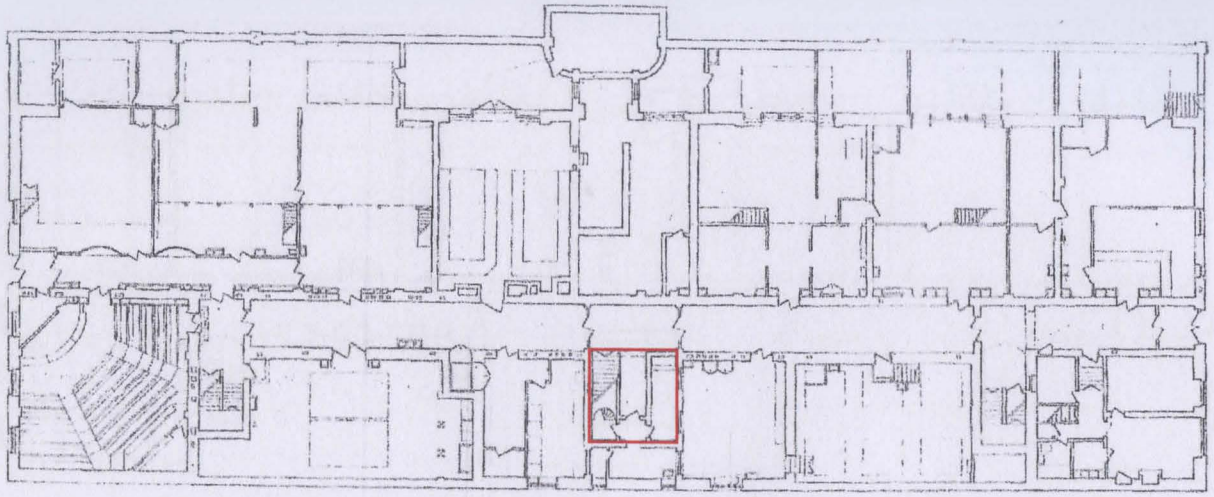


fig. 1.6 view from the upper floor

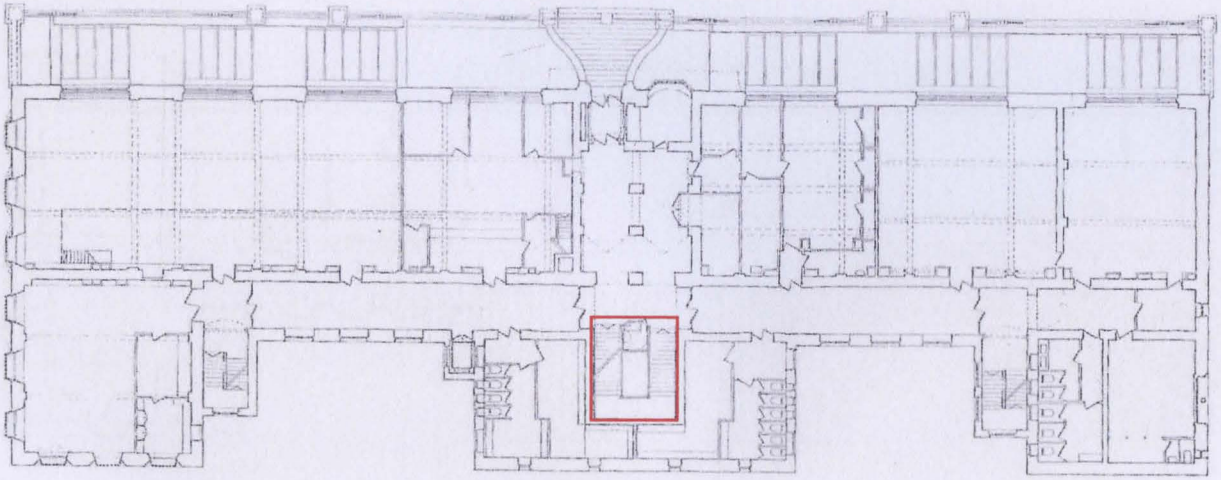
fig. 1.7 basement to ground floor

fig. 1.8 ground to first floor

[10] William Buchanan, Mackintosh's Masterwork The Glasgow School of Art (Glasgow, GSA Enterprises Limited, 1994), 74, 113, 123
[11] Ibid, 24



Basement Plan



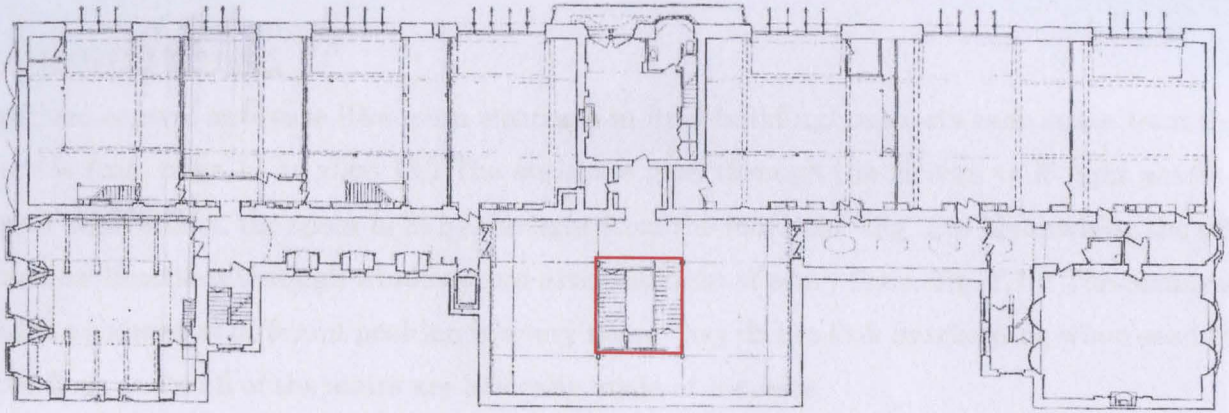
Ground Floor Plan

N

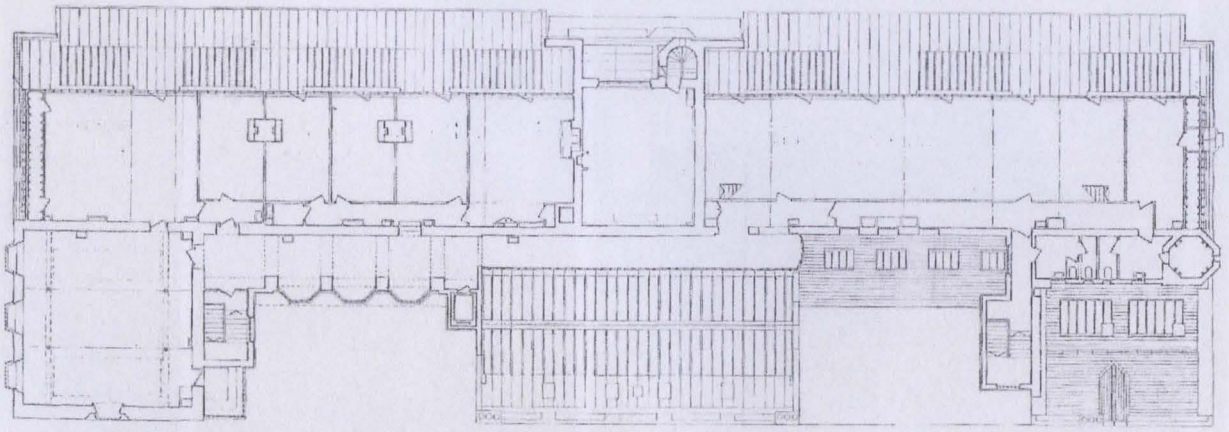
1:500

Position of the main stair marked in red

Image Sourced from Japmes Macaulay Gasgow School of Art, Charles Rennie Mackintosh (London, Phaidon 2002)



First Floor Plan



Second Floor Plan

N

1:500

Position of the main stair marked in red

Image Sourced from Japmes Macaulay Gasgow School of Art, Charles Rennie Mackintosh (London, Phaidon 2002)

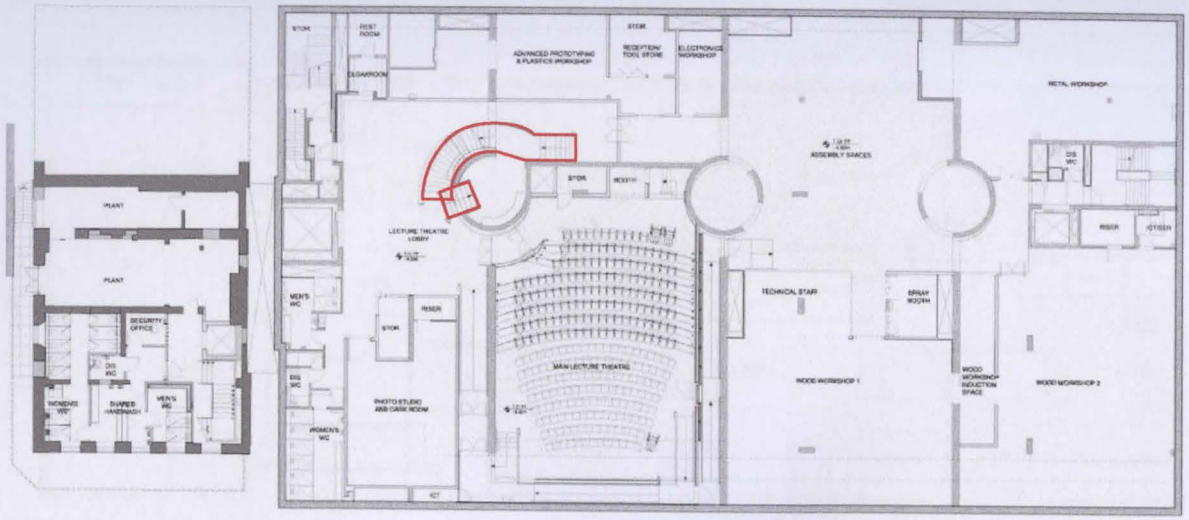
1.5 THE STAIRCASE OF REID BUILDING

In Reid building, the central staircase (the main staircase in Reid building) connects each space from the basement to the forth floor. (The each floor plan is from page 11 to page 13.) The staircase goes through the 'driven void' light shafts, and in the part of the staircase in the 'driven void' light shafts, the space is lit by the light from the roof light. (fig. 1.9) Meanwhile, the other part of the staircase is lit by the light from various directions through windows and artificial light of every floor. (fig. 1.10) The planar shape of the staircase of each floor is different and is arranged at different position in every floor. They do not look overlapping when seen from the upper floor. (fig. 1.11) In Reid building, the floor and wall of the stairs are basically made of concrete.

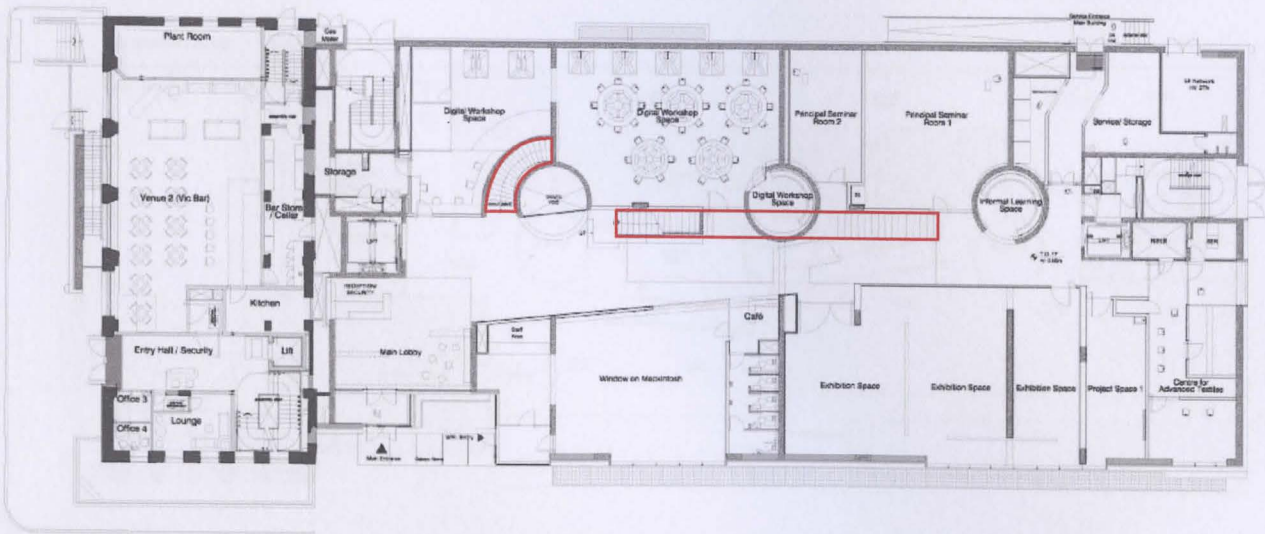
fig. 1.9 light of the 'driven void light shatfs'

fig. 1.10 view from the entrance

fig. 1.11 view from the upper floor



Basement Plan



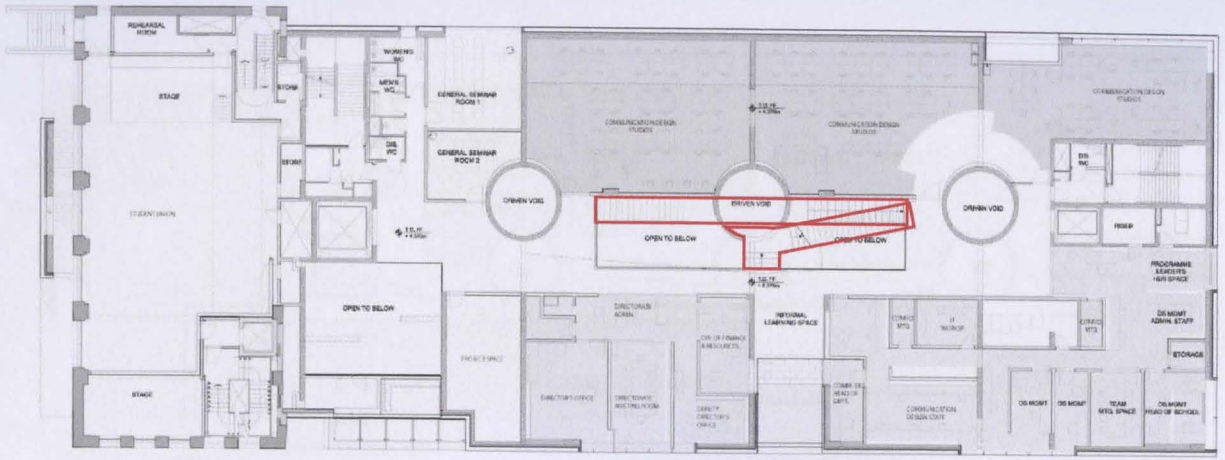
Ground Floor Plan

N

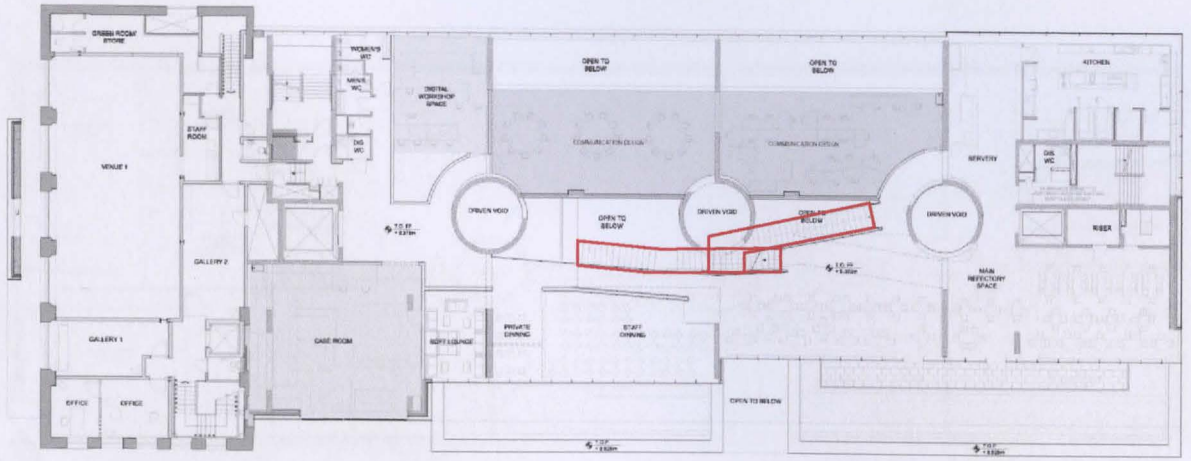
1:500

Position of the main stair marked in red

Image Sourced from "http://www.designboom.com/architecture/steven-holl-seona-reid-building-the-glasgow-school-of-art-03-05-2014/gallery/image/steven-holl-completes-reid-building-at-glasgow-school-of-art-designboom-8/"



First Floor Plan



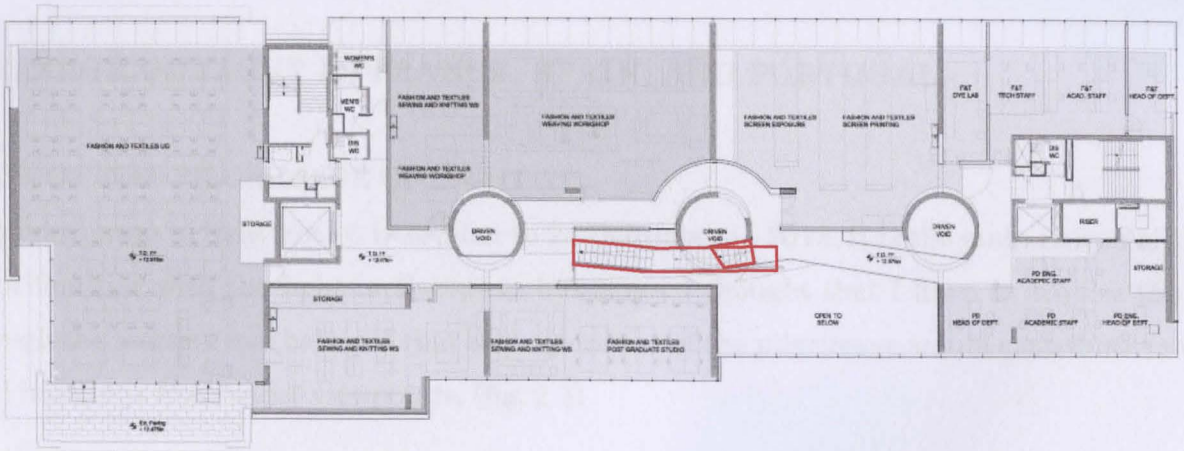
Second Floor Plan

N

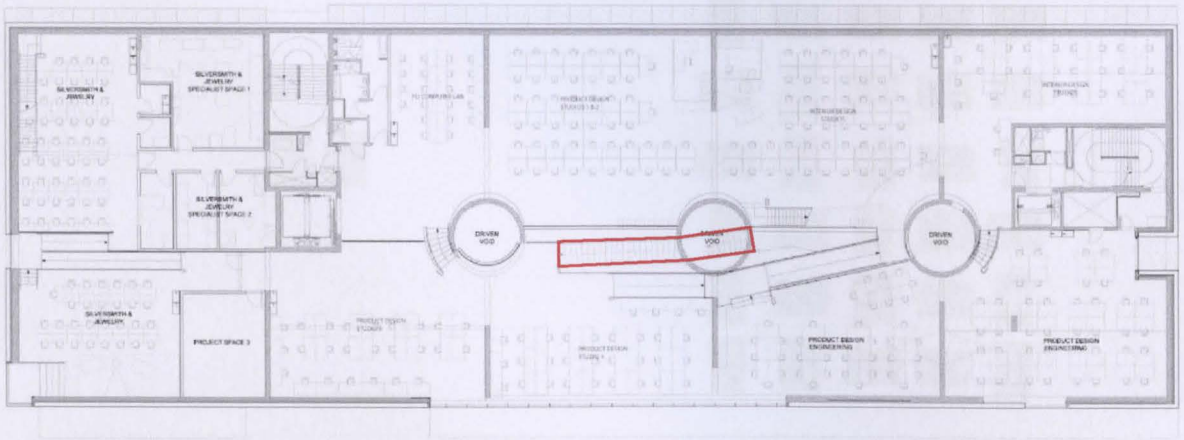
1:500

Position of the main stair marked in red

Image Sourced from "http://www.designboom.com/architecture/steven-holl-seona-reid-building-the-glasgow-school-of-art-03-05-2014/gallery/image/steven-holl-completes-reid-building-at-glasgow-school-of-art-designboom-8/"



Third Floor Plan



Fourth Floor Plan

N

1:500

Position of the main stair marked in red

Image Sourced from "http://www.designboom.com/architecture/steven-holl-seona-reid-building-the-glasgow-school-of-art-03-05-2014/gallery/image/steven-holl-completes-reid-building-at-glasgow-school-of-art-designboom-8/"

CHAPTER 2 _ PILGRIMAGE OF LIGHT IN FRANCE, SPAIN, AND PORTUGAL

2.1 THE INTRODUCTION OF THE PILGRIMAGE OF LIGHT

I conducted the pilgrimage of light from 6 December to 24 December in 2013. It is the main reason of the pilgrimage of light that I am from Japan and not familiar with the light in European buildings. I thought that I have to acquire the knowledge of the light of European buildings through the journey and believed that the experience of the pilgrimage would contribute to the research of the light of the Mackintosh and Reid buildings from wider viewpoints. (fig. 2.1)

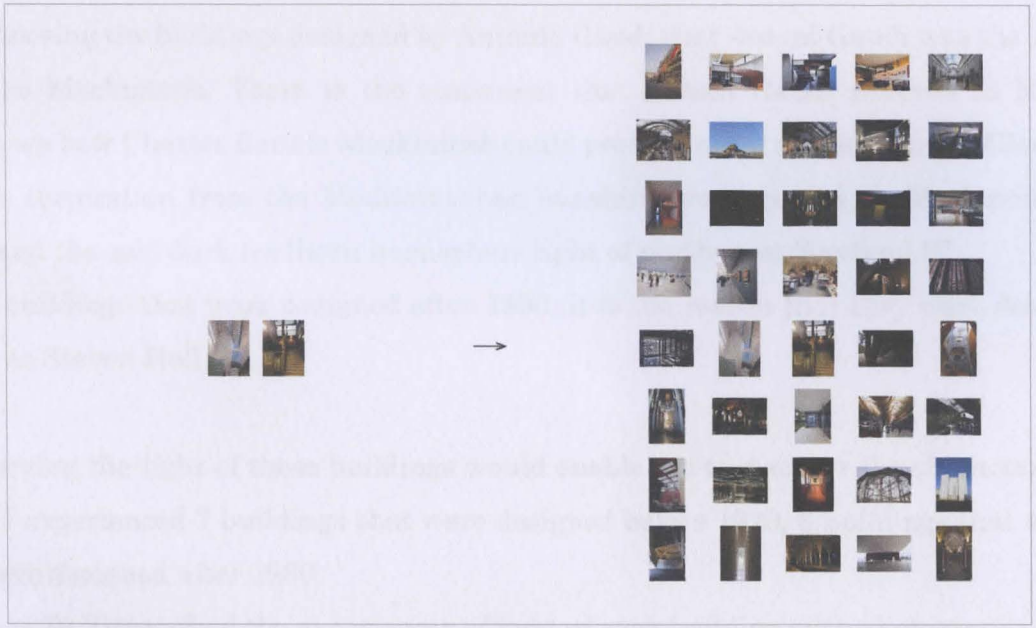


fig. 2.1 The change of knowledge about the light of European buildings by the pilgrimage of light (left: before the pilgrimage / right: after the pilgrimage)

2.2 THE 17 BUILDINGS IN THE PILGRIMAGE OF LIGHT

In this dissertation, I report the experience of 17 buildings of the buildings that I visited during the pilgrimage. I decided those buildings based on the relationship with the Mackintosh and Reid buildings. Five buildings of those were designed by Le Corbusier, three buildings were designed by Antoni Gaudi, and four buildings were designed by Alvaro Siza, Jean Nouvel, and so on, after 1980.

I chose the buildings designed by Le Corbusier based on the reasons that they are made of concrete like Reid building and Le Corbusier also designed buildings with well considering light. "The key is light, and light illuminates shapes, and shapes have an emotional power.[12] (Le Corbusier)"

It is the reason of choosing the buildings designed by Antonio Gaudi that Antoni Gaudi was the architect who designed buildings in the almost same period as Mackintosh. There is the statement that Antoni Gaudi referred to Mackintosh. "Antoni Gaudi once commented that he could not see how Charles Rennie Mackintosh could produce great architecture in Glasgow – a city where there was no sunshine... however, Gaudi's inspiration from the Mediterranean sunshine was equaled by Mackintosh's own sensibilities about the subtleties of Glasgow stone, and the cold dark northern hemisphere light of north-west Scotland.[13]"

With regard to the buildings that were designed after 1980, it is the reason that they were designed by architects who designs buildings in the same period as Steven Holl.

I believed that observing the light of those buildings would enable me to discover the characteristics of light of the Mackintosh and Reid buildings. Overall, I experienced 7 buildings that were designed before 1920, 6 buildings that were designed between 1920 and 1980, and 4 buildings that were designed after 1980.

From page 16 to page 38, I described the experiences of light of each building with photographs and plain comments.

---

[12] Mary Ann Steane, the architecture of light, (Oxon, Routledge, 2011), 20
[13] Carl Gardner, Raphael Molony, LIGHT Re-interpreting Architecture (Crans-Pres-Celigny, 2001), 2





Maison La Roche / Le Corbusier / Paris / 1923-1925

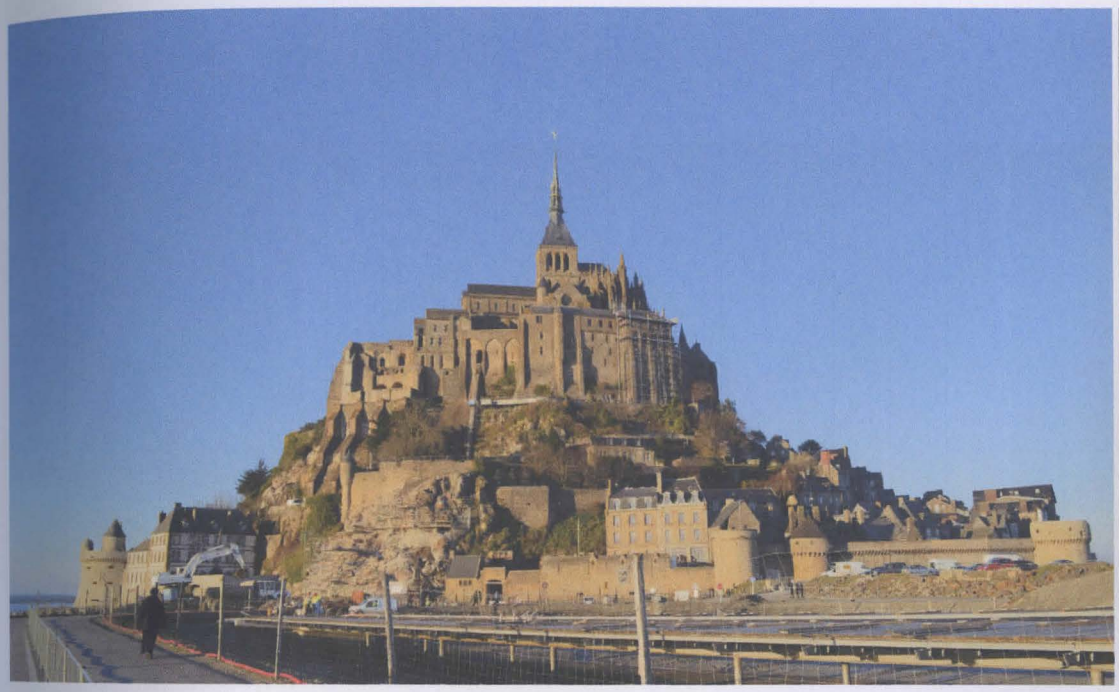
The visit to Maison La Roche was my first visit to the world of Le Corbusier. Before visiting the house, I thought that Le Corbusier was the main person of the modern architectural movement and he ignored the humanity in order to make different works from other architects. But I have changed my mind after visiting the house. The Maison La Roche is filled with various materials and well considered details that allow people to become familiar with the space. I could find the humanity in the house.

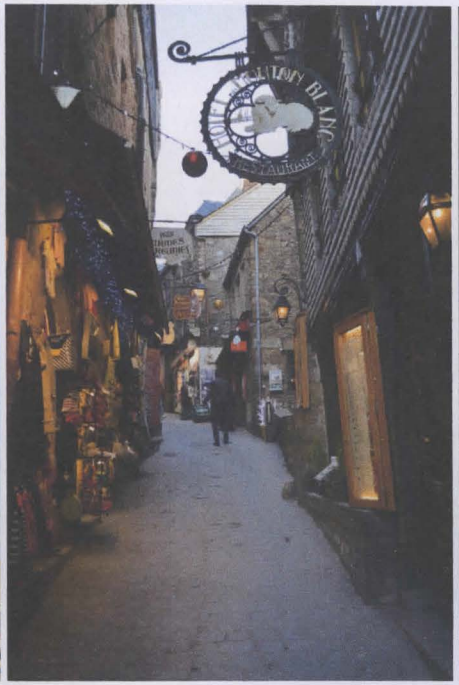
fig. 2.2 Cube Forest (Museum of Masayoshi Nakamura)[14]

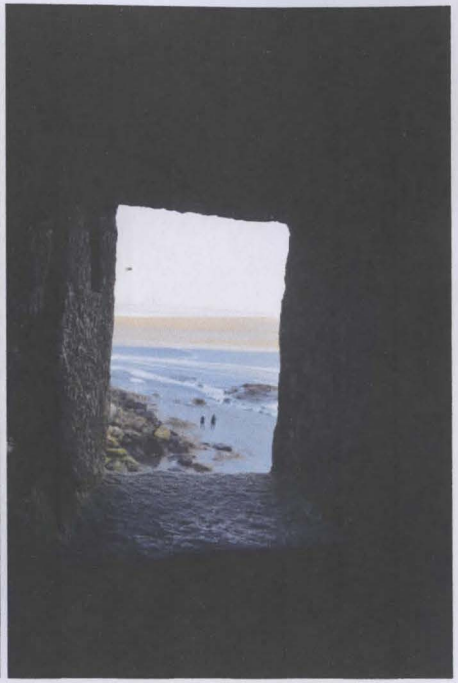
Maison La Roche / Le Corbusier / Paris / 1923-1925

With regards to the light, the entrance has a quiet and gentle light. The atmosphere reminded me of the house which is "Cube Forest" , the museum of Masayoshi Nakamura which is designed by Kazuo Shinohara in Tokyo in 1971. (fig. 2.2) The house "Cube Forest" does not also have strong light. As another feature of light in Maison La Roche, most of rooms have upper windows. So I remember gentle indirect light rather than direct light.

([14] "Kenchikuka Jr-blog" . Ken-Architects. Accessed 31 March 2014. http://kenarchitects.blog.shinobi.jp/Category/5/4/)







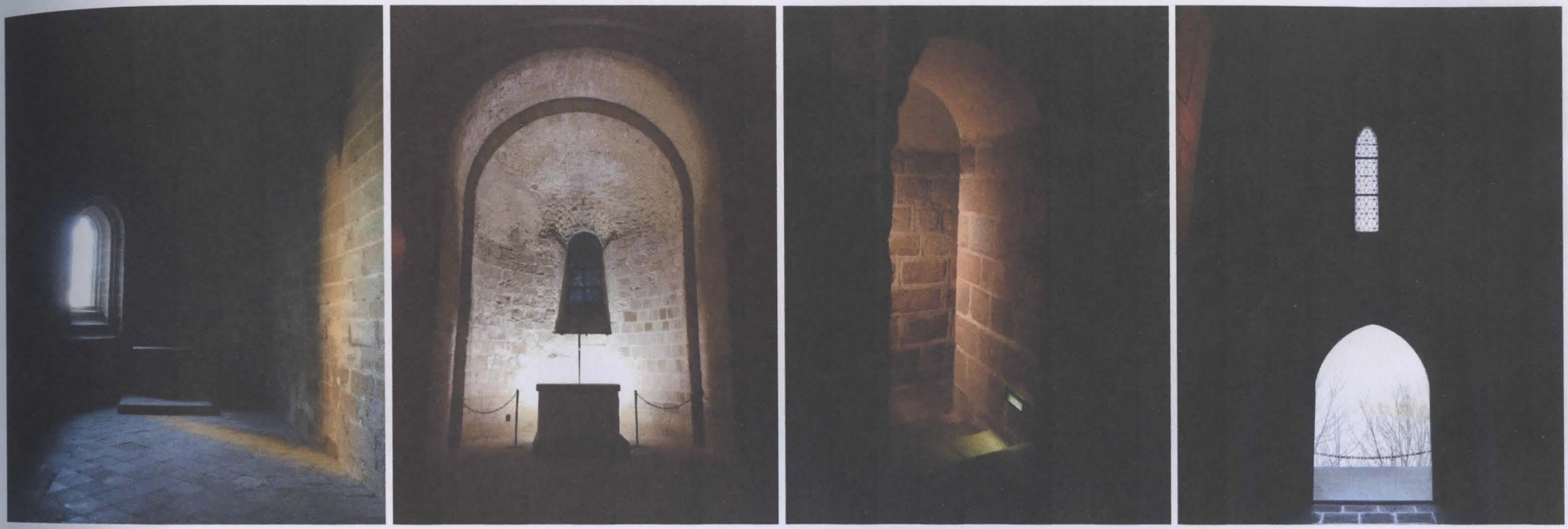
Mont-Saint-Michel Abbey / the island of Mont-Saint-Michel / 1523

The experience of light in the abbey was similar to the experience of light in nature because the building continues the scenery of the town naturally. From the window, people can see the scenery of the sea and sky. The scenery tells us that the island is located at the isolated place from the world.



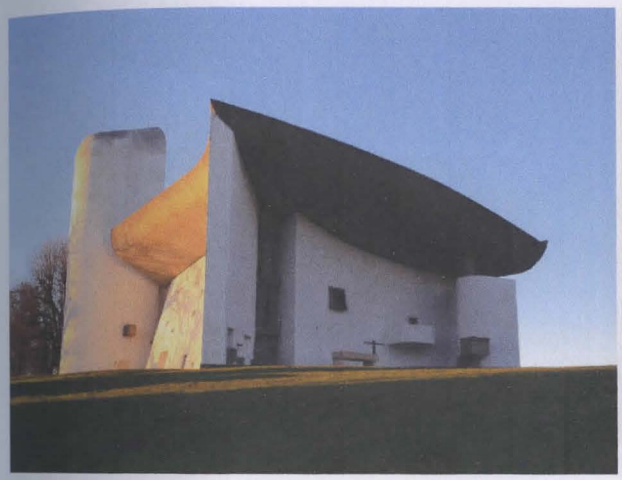

Mont-Saint-Michel Abbey / the island of Mont-Saint-Michel / 1523

Mont Saint Michel Abbey consists of mainly the abbey church, the west terrace, the cloister, and the refectory. In the abbey church, the large portion of the space inside space is covered by shadow in contrast to the outside space which is filled with light. The shadow let my mind calm down from the merry emotion made by outside light.



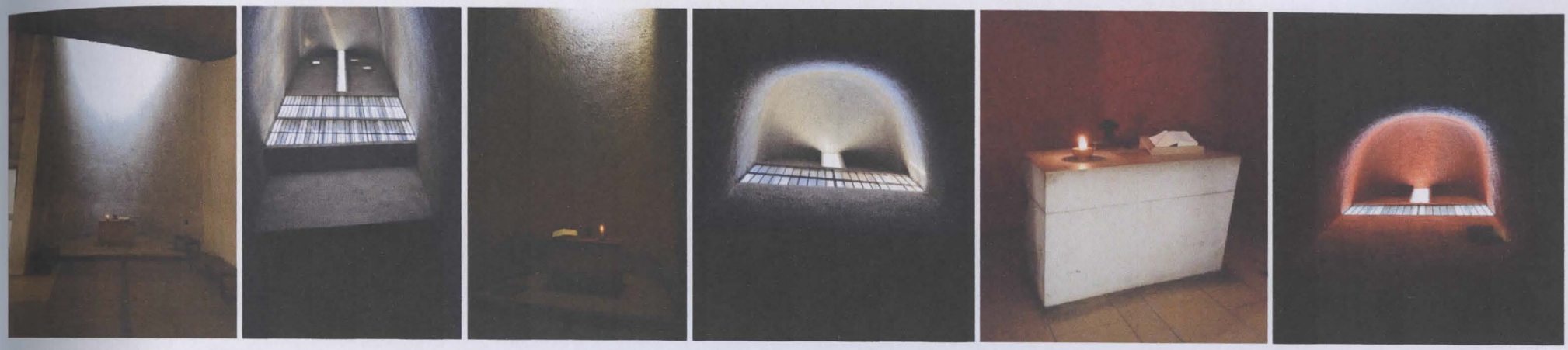
Mont-Saint-Michel Abbey / the island of Mont-Saint-Michel / 1523

The light gave the places special meanings and gave me various emotions.



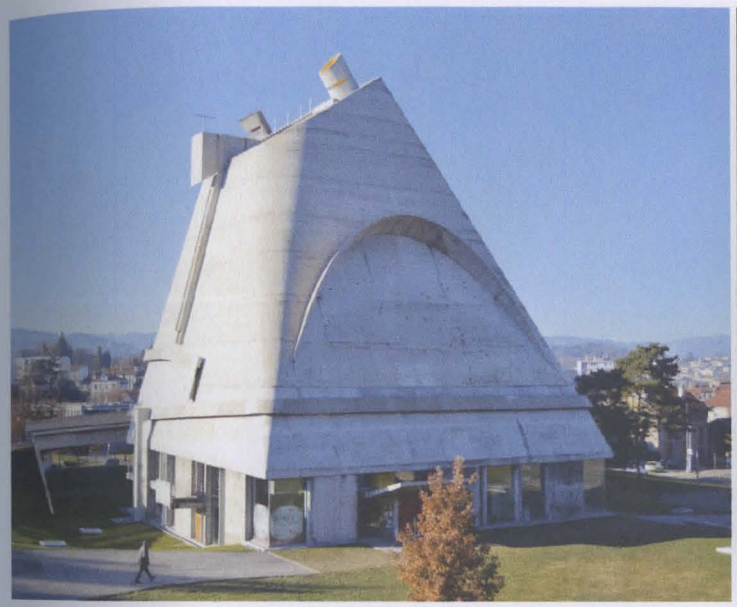
Notre Dame du Haut / Le Corbusier / Ronchamp / 1955

Overall, the light is restricted. The reflection of sound tells us the depth of the space. The altar and auditorium do not face the wall which has many windows so that people can feel comfortable while praying. On the other hand, the north entrance faces the wall which has lots of windows and lets people see dramatic light on the wall that appears like an art work.



Notre Dame du Haut / Le Corbusier / Ronchamp / 1955

Each chapel has its own proportion and color. These features make each space a different atmosphere



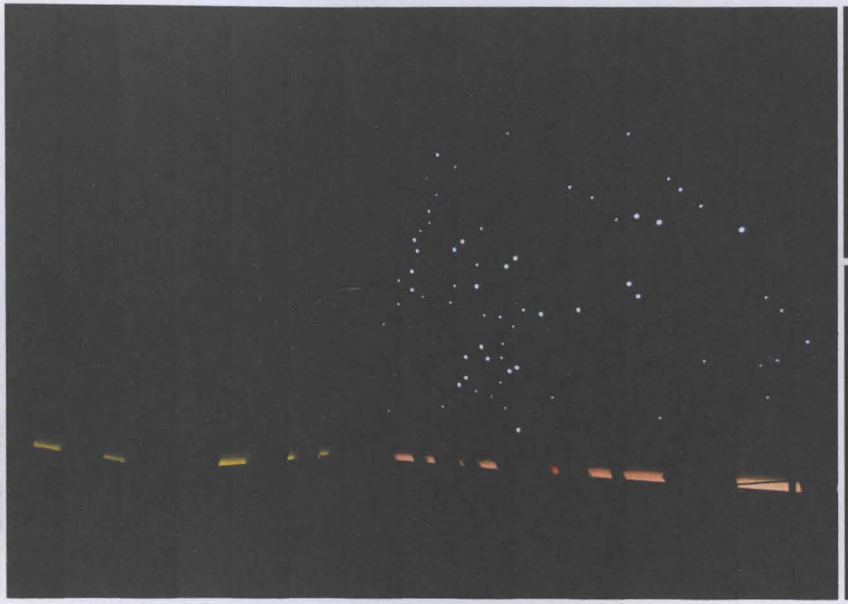
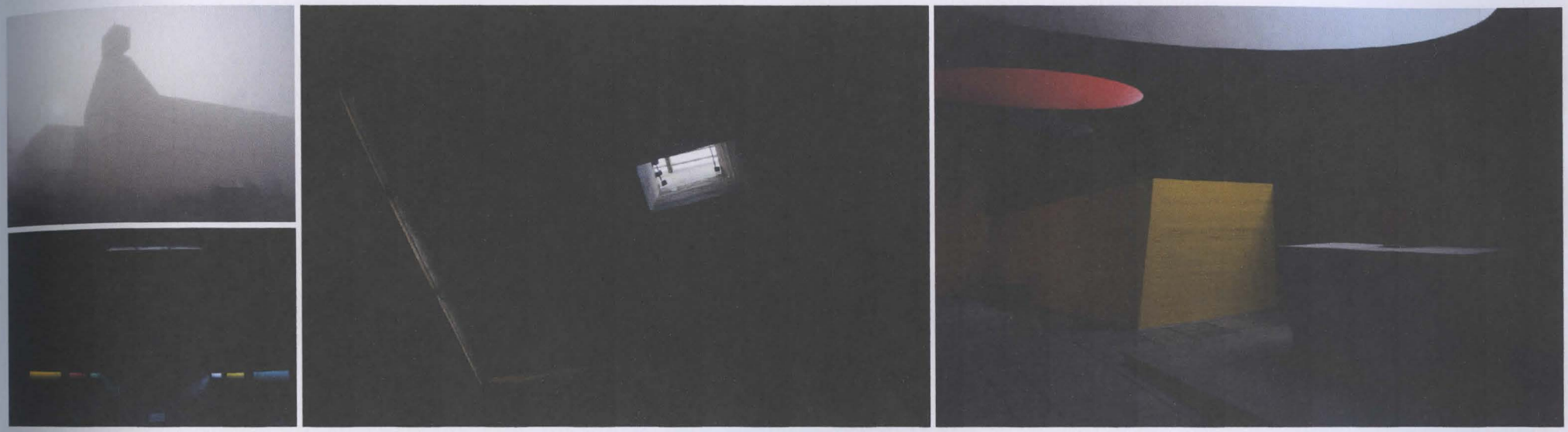


fig. 2.3 Japanese shrine at night

The Church of Saint Pierre / Le Corbusier / Firminy / 2006

The upper floor is the church. If I consider "Notre Dame du Haut" as the space like an inside space of the mother' s body, the space of The Church of Saint Pierre is like a cave. On the wall behind the altar, there are a lot of small windows which shapes look like dots. They look like stars in the daytime. Under those windows, there are rectangular windows with colors. Those reminds me of the sacred atmosphere created by lanterns of a Japanese shrine at night. (fig. 2.3) Compared to "Notre Dame du Haut" , the light is more restricted and the space seems to be covered by gentle light. In spite of being located at the center of the town, the atmosphere is quite different from outside. It lets us reflect on our daily lives.



Sainte Marie de La Tourette / Le Corbusier / Lyon /1957

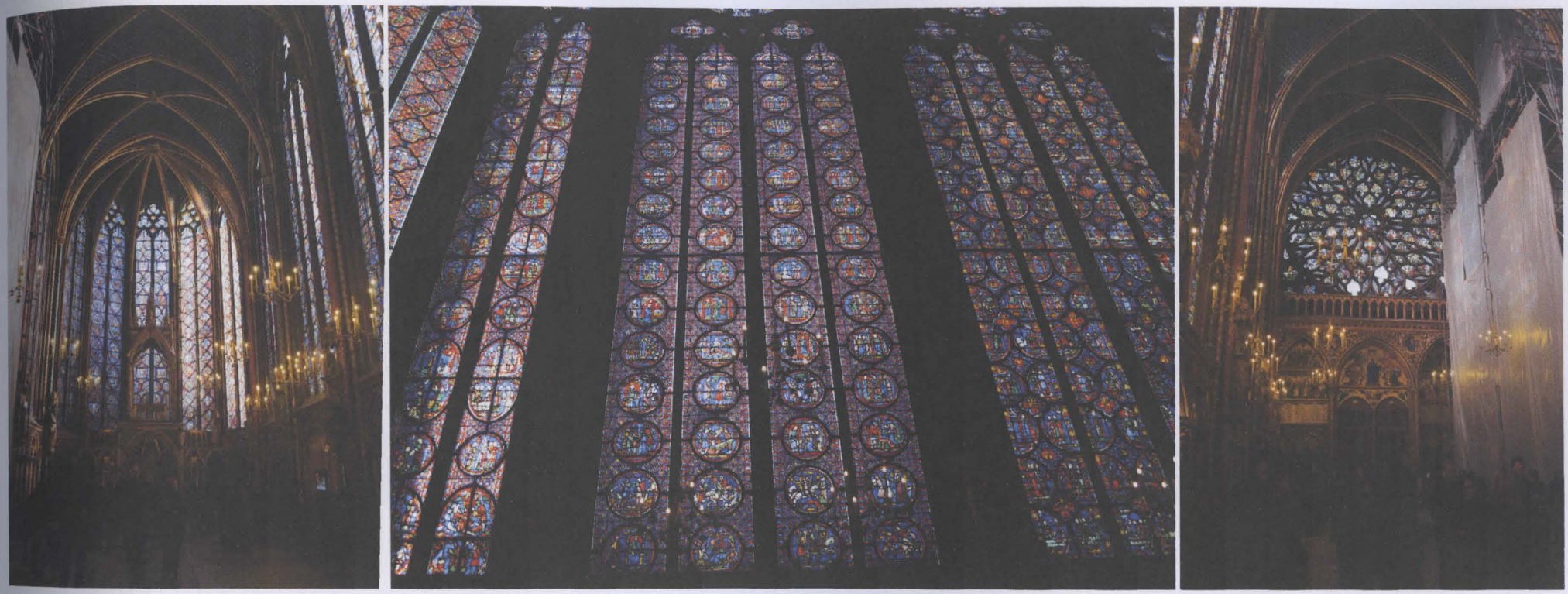
"The distance from the roof light decides the size of space." I felt that the distance between people and the roof light makes the size of space here. In the larger place for worship, the roof light is unreachable and the space seems to be bigger. On the other hand, in the smaller place for worship, the roof light is near the head of people worshipping in that place and the space seems to be smaller.

Villa Savoye / Le Corbusier / Poissy /1931

The house is famous because it realizes "Les 5 points d'une architecture nouvelle". It made me nervous, but in reality, I felt comfortable as I examine every corner of the house and could forget the serious logic. It might be made by the features that most of the space are outside, the roof garden makes sacred atmosphere, the experience that we can walk on the slope slowly, and the experience that we can relax in the living room that is filled with light from the huge window.

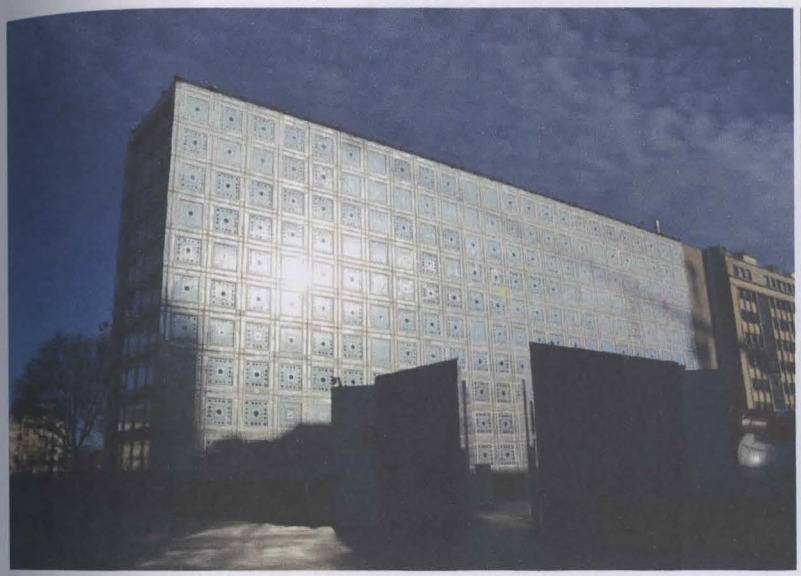
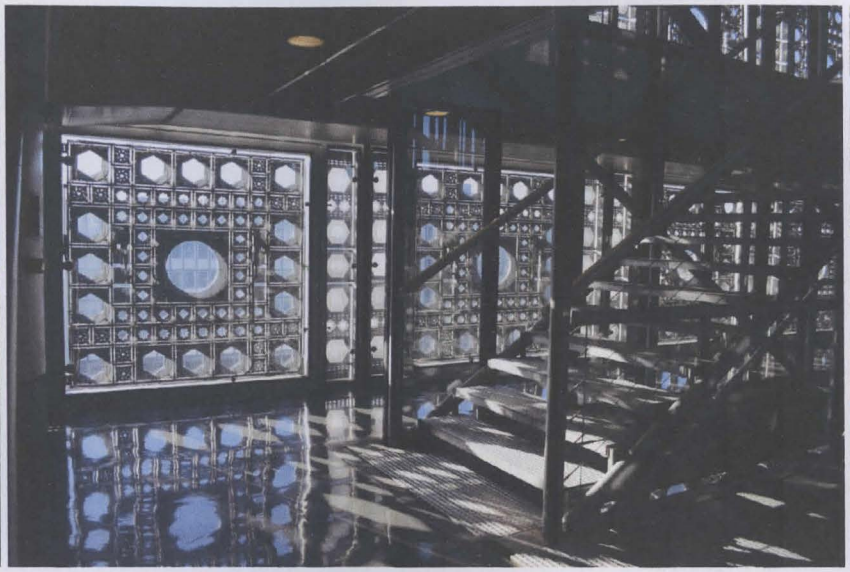
Villa Savoye / Le Corbusier / Poissy /1931

Each room has the roof light. I found the light as a form of beauty.



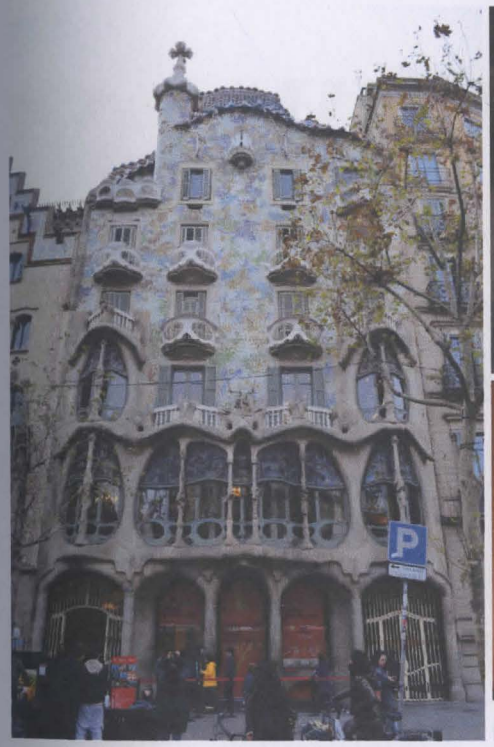
Sainte Chapelle / Paris / 1248

The brilliant light comes from stained glass. The light of this chapel seems to try to get further effect with the support of the stained glass.


Arab World Institute / Jean Nouvel / Paris / 1987

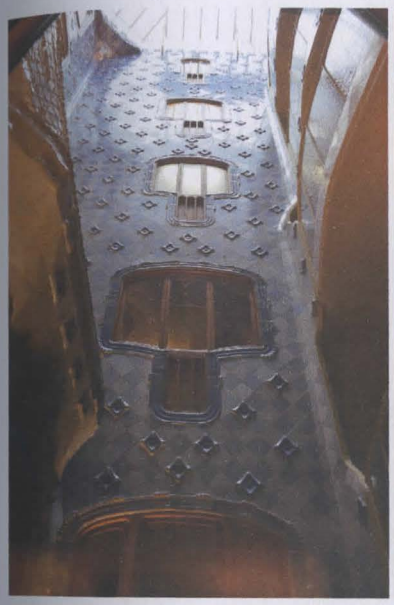
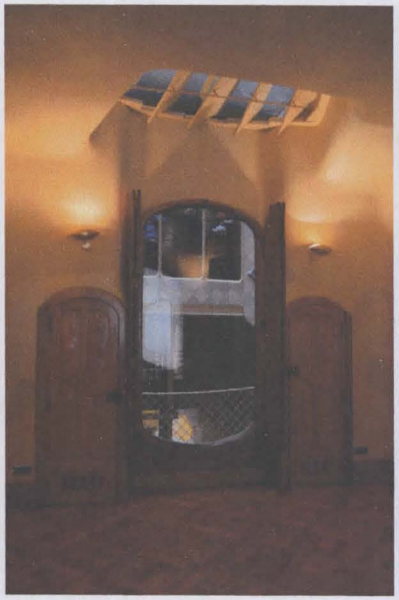
"Decorated Shadow " The light is sliced by the window and the space gets unique shade.

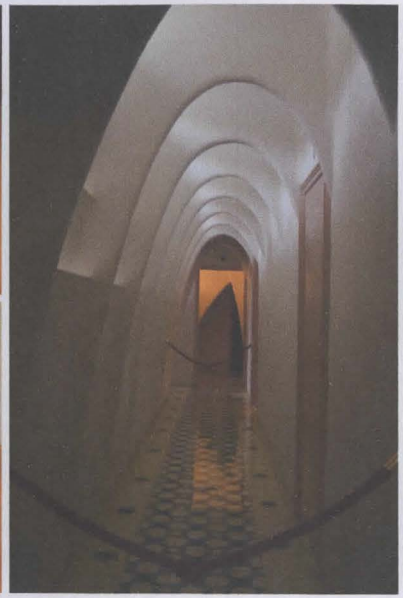
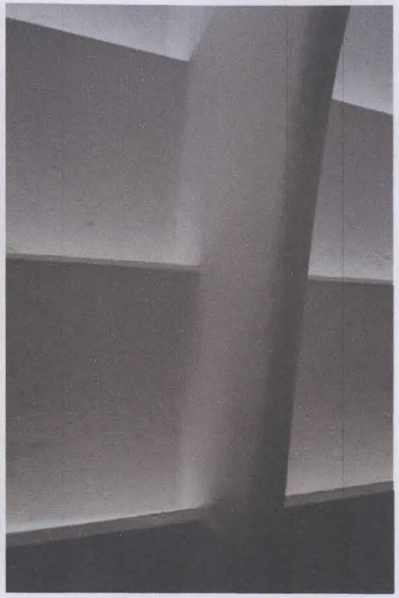




Casa Batllo / Antoni Gaudi / Barcelona / 1904

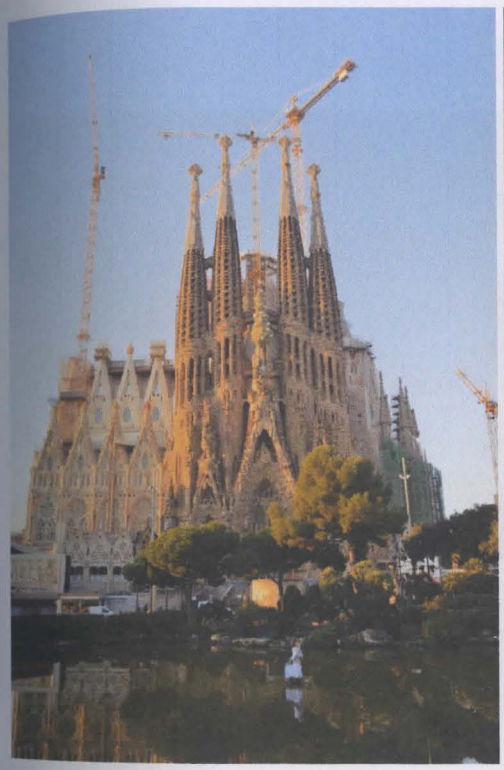
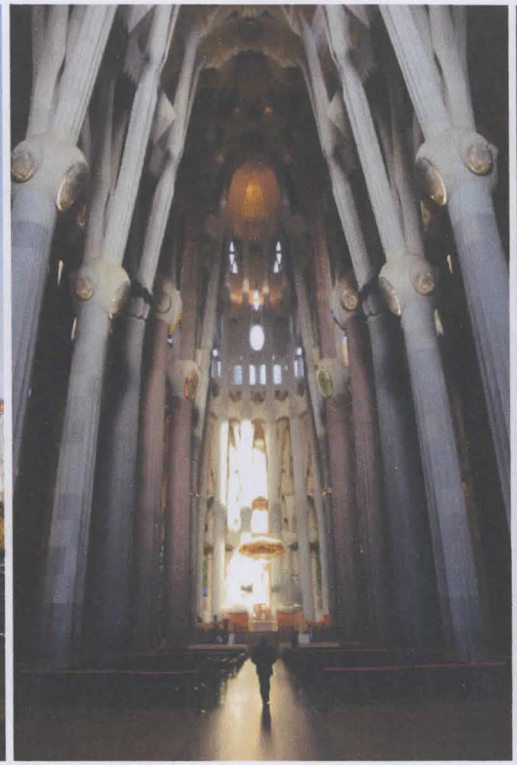
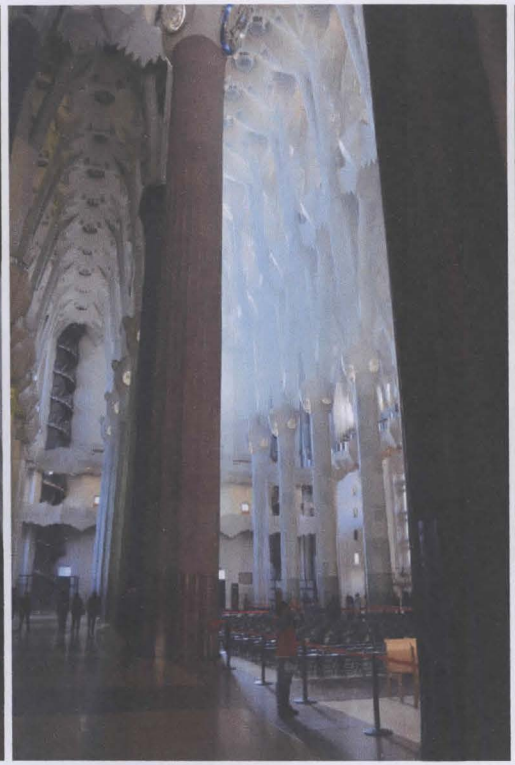
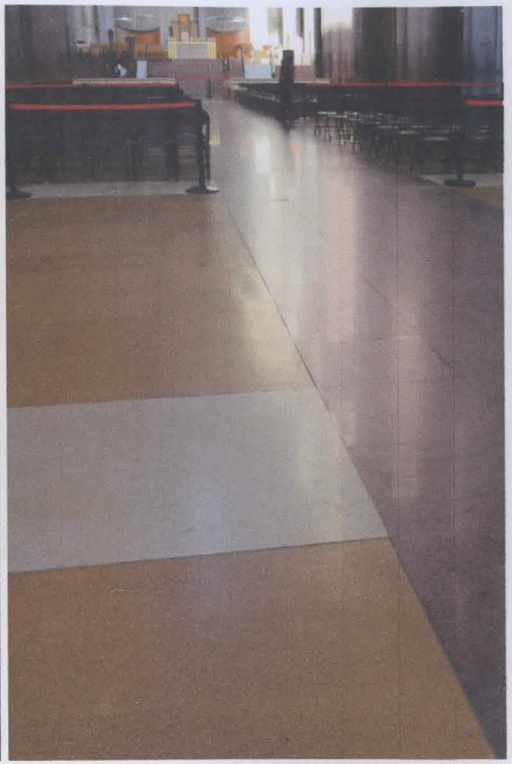
It is the romantic space that is referred to sea. The design of the ceiling, the shape and color of windows makes the sensual atmosphere. The glass of balustrade is wavy and it lets us feel as if we were in the inside of sea when we walk with watching the glass.

Casa Batllo / Antoni Gaudi / Barcelona / 1904

Considering the windows on the upper floors, these windows are bigger compared to those on the lower floors, which are smaller. There are many plain devices that allow people to control the quantity of light and wind by hand.

Sagrada Familia / Antoni Gaudi / Barcelona / 1882-

The white high pillars create the light space. On the other hand, I thought the atmosphere was not of good quality because of the low density of shadow in spite of a religious space. The texture of the floor might be one of the causes of that feeling as well.

Colonia Guell / Antoni Gaudi / Barcelona / 1915

In the space, the existence of stone stands out, and the atmosphere of the space is similar to a cave. The inside atmosphere is ritual, while that of the outside is merry. I found mellowness in this contrast.

Barcelona Pavilion / Ludwig Mies van der Rohe / Barcelona / 1929

The space is quite different from the space designed by Le Corbusier and Antoni Gaudí. Everything becomes light (not heavy). The space seems to be released from material and gravity. It lets us feel that we are always near light.

Madrid-Barajas Airport Terminal 4 / Richard Rogers / Madrid / 2006

The curvy frames continue at the air terminals. It feels comfortable to walk under the organic form. We can feel freedom and peace of mind under it. On the other hand, the space downstairs is dominated by lots of artificial light. The atmosphere is very serious and seems like a providing ground.

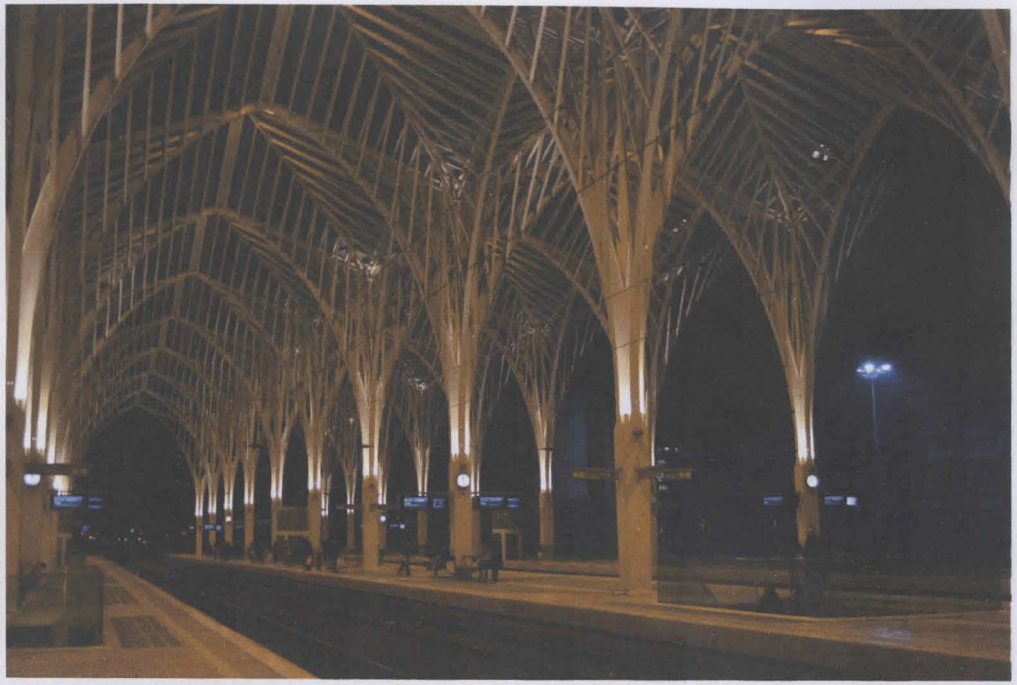


Palacio de Cristal / Ricardo Velázquez Bosco / Madrid /1887

The space does not only a glass wall, but also has a glass ceiling. The light in the space emphasizes that the space is empty. In the space, we cannot easily find a comfortable place to stay. Walking slowly is the most suitable way to observe the space. When we walk slowly in the space, we can see nature and sky through the glass. The act makes us feel comfortable.

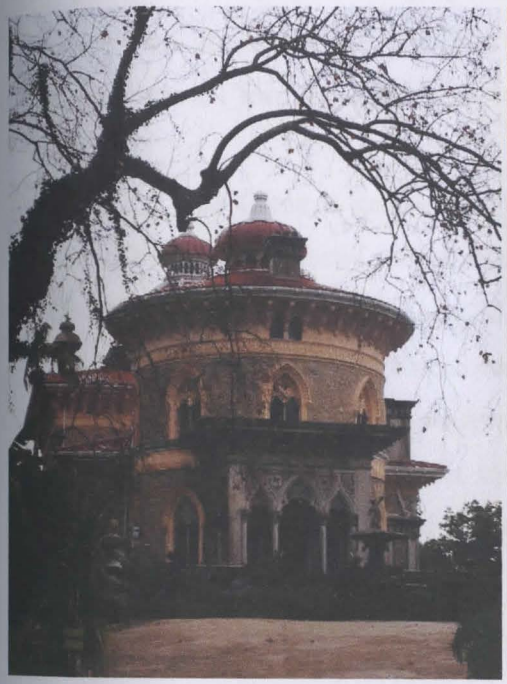
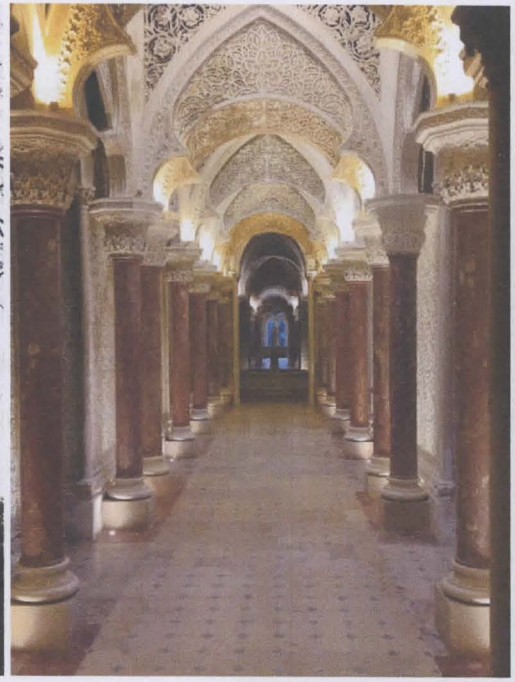
Serralves Museum / Álvaro Siza Vieira / Porto / 1999

The artificial light acquire the special ability to let people think that the space is of high quality. After going downstairs, we can see the light from the big window. (fig. 2.4) The light looks sacred. The wall toward the light looks as if it were gradually dissolving.



Lisbon Orient Station / Santiago Calatrava / Lisbon / 1998

The atmosphere is quite different during the daytime compared to night. At night, the beauty of the structure is clearer and it is due to the artificial light. On the other hand, the natural light makes the existence of the structure weak in the daytime.

Monserrate Palace / James Knowles Jr / Sintra, Portugal / 1858

The space looks like a jewel. The entire wall is decorated and it made me think as if the space did not have walls. Light in here is used to make the decoration on wall more attractive and beautiful. In that way, the light serves as a "light to decorate the decoration" .

2.3 THE CONCLUSION OF THE PILGRIMAGE OF LIGHT

From page 16 to page 38, I could describe each experience of light by different language because the quality of each light has their own characteristic. In that way, it was clear that I experienced diverse types of light in the pilgrimage of light. Based on the experiences, I found some characteristics of light of the two staircases of the Mackintosh and Reid buildings and these are as follows.

One thing is related to my previous experiences as the researcher. During my journey to the pilgrimage of light, I experienced the spaces that remind me of the light of Japanese buildings. Example of these spaces are the "Maison La Roche" (page 17) and "The Church of Saint Pierrre" (page 23). This experience is similar to the experience of light at the staircase of Mackintosh building. The dim light and shadow in the Mackintosh staircase also reminded me of the quality of light of Japanese traditional buildings. (fig. 2.5) On the other hand, the light of the staircase of Reid building does not remind me of Japanese buildings.

This shows that light might remind people of previous experiences if the quality of light is similar. It means that light has the capability to possibly remind people of the culture and experience beyond the physical world.

fig. 2.5 The interior of Shisen-do (one of Japanese traditional buildings)

During the pilgrimage of light, I found that some experiences of light are similar to the experiences of the light of two staircases of the Mackintosh and Reid buildings. With regard to the light of the staircase of Mackintosh building, the experience of light of staircase of the basement is similar to that of the "Notre Dame du Haut" (page 21) and the experience of light of staircase of the ground floor is similar to that of the "Villa Savoye" (page 25). As I state in the chapter 3 (page 54), there are two different atmospheres of light in the staircase of the basement and the ground floor of the Mackintosh building. The atmosphere of staircase of the basement is dank shade and is similar to the restricted light of the "Notre Dame du Haut". Meanwhile, that of the ground floor is filled with light and is similar to the living room of the "Villa Savoye".

In that way, it could be said that the quality of light of the basement staircase is similar to the light of church/worship and that of the ground floor staircase is similar to the light of house when I categorize the light within the context of the light of the European buildings.

In terms of the light of the staircase of the Reid building, the experience of light of the staircase within the driven void light shaft is similar to the experience of light in the "Mont-Saint-Michel Abbey" (page 18), and that of the staircase of the non-driven void light shaft is similar to the experience of light in "Maison La Roche and Serralves Museum" (page 17, 36). In the staircase of Reid building, the atmosphere of the light of the driven void light and that of the non-driven void light shaft are different. (page 87) In the staircase within the driven void shaft, the light seems to have some special meaning, which is similar to the light of the "Mont-Saint-Michel Abbey". Meanwhile, in the staircase of the non-driven void light shaft, people do not see windows directly and the light is almost indirect light like the "Maison La Roche and Serralves Museum".

Therefore, when I categorize the light in a similar way to Mackintosh building, it could be said that the quality of light of the staircase within the driven void light shaft is similar to the light of abbey, and that of the staircase of the non-driven void light shaft is similar to the light of house or art museum.

CHAPTER 3 _ EXPERIMENTS AND DISCOVERIES IN THE TWO STAIRCASES

3.1 THE INTRODUCTION OF THE THREE EXPERIMENTS

I conducted three experiments of the light, which are "Sequence of Light", "One Day Light", and "Light Measurement", in the two staircases of the Mackintosh and Reid buildings. Through these experiments, I tried to discover the features and differences of the light of two staircases from various viewpoints.

The experiment of the "Sequence of Light" can be seen from page 42 to page 55, the "One Day Light" can be seen from page 56 to page 79, and that of the "Light Measurement" can be seen from page 80 to page 88.

3.2 SEQUENCE OF LIGHT

I created the photography that recorded the sequence of light in order to record the experience of light and find the difference of the quality of light in the two staircases.

The photographs are basically taken at each three steps in the staircase. I recorded the photographs of light in each staircase by dividing into two types sequence (from the ground floor to the upper floor, and from the ground floor to the basement) so that the photography can show experiences as similar as possible to those of students' daily lives.

In addition, in the sequence photography, I tried to record not only the sequence of light, but also upper views or lower views which people usually see from a staircase on their daily lives.

The photographs of the sequence of light can be seen from fig. 3.1 to fig. 3.9.

fig. 3.1 sequence of the experience of light (from the ground floor to the first floor)

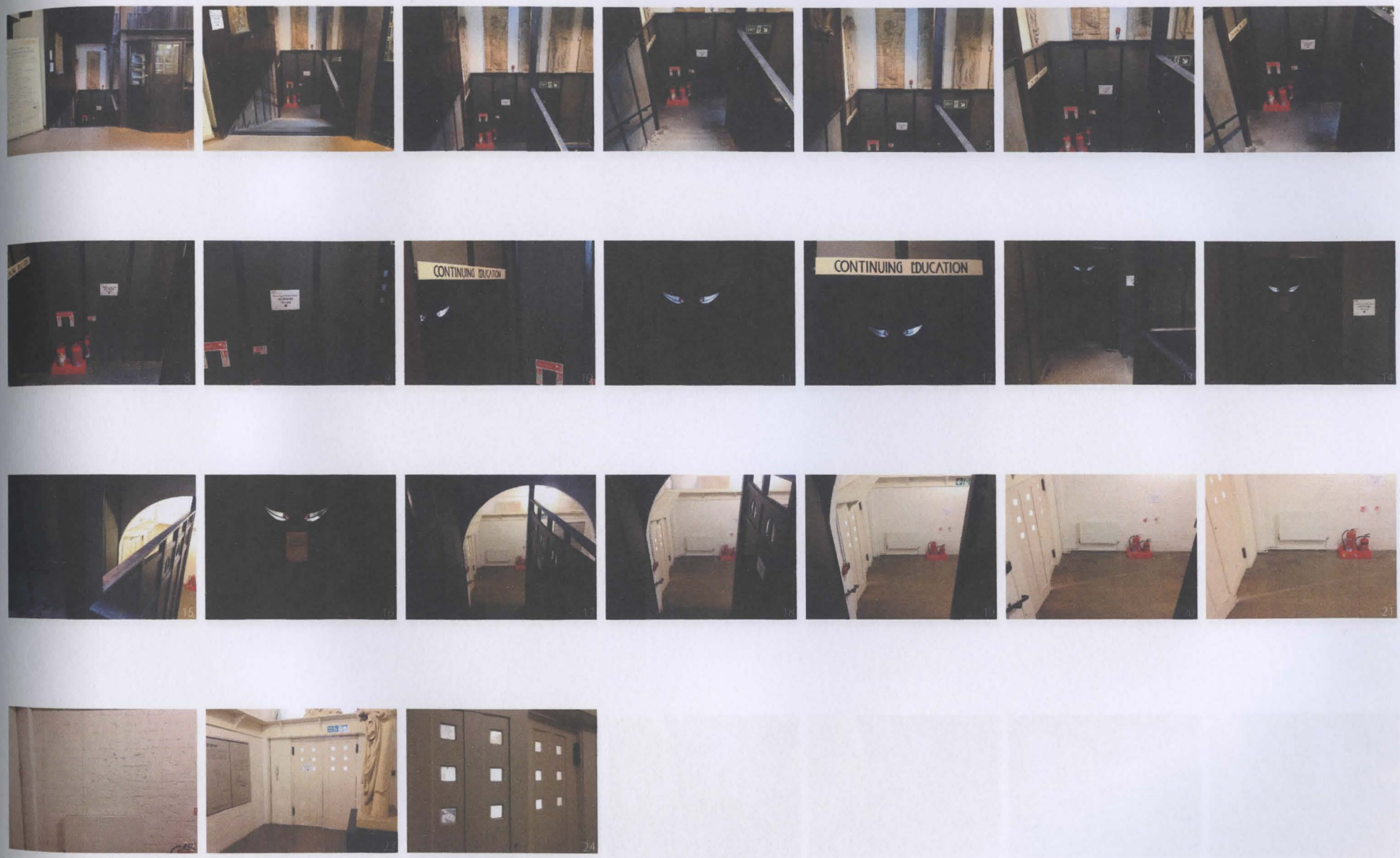


fig. 3.2 sequence of the experience of light (from the ground floor to the basement)

fig. 3.3 sequence of the experience of light (from the ground floor to the fourth floor)

fig. 3.4 sequence of the experience of light (from the ground floor to the fourth floor)

fig. 3.5 sequence of the experience of light (from the ground floor to the fourth floor)

fig. 3.6 sequence of the experience of light (from the ground floor to the fourth floor)

fig. 3.7 sequence of the experience of light (from the ground floor to the fourth floor)

fig. 3.8 sequence of the experience of light (from the ground floor to the fourth floor)

fig. 3.9 sequence of the experience of light (from the ground floor to the basement)

3.3 DISCOVERIES OF SEQUENCE OF LIGHT

Through the sequence of light photography, I found the following features and differences of light in the staircases of the Mackintosh and Reid buildings.

As the overall impression, the experience of the sequence of light in the staircase of Mackintosh building seemed to be gradation. On the other hand, I felt that that of Reid building is almost uniform. In order to clarify the impression, I made the diagrams with monochrome photographs. (fig. 3.10 and fig. 3.11)

The diagram shows that the sequence of light in the staircase of Mackintosh building starts from dank shade of the basement, and then gradually getting the light with climbing to the first floor. (fig. 3.10) And the following diagram shows that the sequence of light in the staircase of Reid building sees subtle change from the ground floor to the fourth floor compared to that of Mackintosh building. (fig. 3.11)

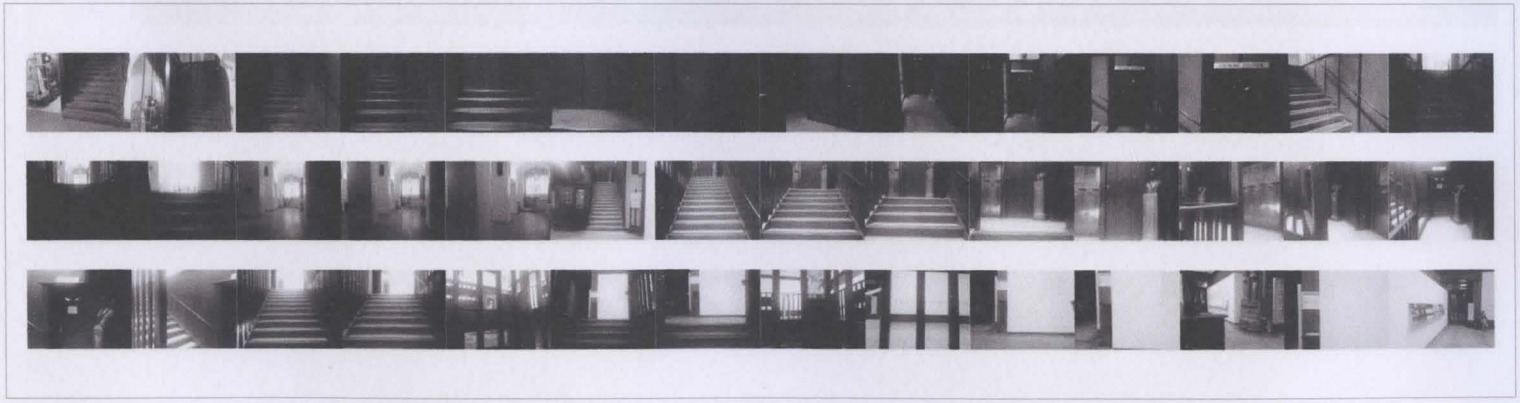


fig. 3.10 The impression of sequence of light in the staircase of Mackintosh building (from basement to the first floor)

fig. 3.11 The impression of sequence of light in the staircase of Reid building (from ground floor to the fourth floor)

I believe that the difference of the impression is attributed to the difference of the design of the banisters. In Mackintosh building, the banisters of the staircase of the ground floor are the series of sticks, which are made of timber, and they allow the light from the roof light to go through the banisters and make the staircase bright. Those of the staircase of the basement are the surface of timber and stone, which reflect the light from the upper floors and make dank shade in the basement. (fig. 3.12)

The difference of banisters in each floor would create two different atmospheres and gradation of light in the staircase of Mackintosh building. This means that Mackintosh tried to control the light with utilizing the banisters and tried to create the two different atmospheres in one staircase with only the light from the roof light.

fig. 3.12 The banisters of the staircase of Mackintosh building (left: series of sticks in the ground floor / right: surface of timber in the basement)

On the other hand, the banisters of the staircase of Reid building are semitransparent glass surface or aluminum mesh. Those consistency surfaces allow the light from various directions to infiltrate into the staircase at each floor, and would create the uniform atmosphere of light in the staircase of Reid building.

fig. 3.13 The banisters of the staircase of Reid building (left: semitransparent glass / right: aluminum mesh)

3.4 ONE DAY LIGHT

I made the photography that recorded "one day light" of light in order to observe the change of the light during one day, and clarify the difference of the way to change of light in the two staircases.

I conducted the photography at four times (10am / 1 pm / 4pm / 7pm) on 8 March 2014. From the following page, I organized some photographs that I thought describe the features of the way to change of light of the both staircases.

The photographs of one day light in the staircase of Mackintosh building can be seen from page 57 to page 65 and those of Reid building can be seen from page 66 to page 75.

fig. 3.14 View from the entrance at the ground floor (AM·PM)

fig. 3.15 View at the middle of the staircase of the ground floor (AM-PM)

fig. 3.16 View toward the first floor from the middle of the staircase of the ground floor (AM-PM)

fig. 3.17 View at the first floor (AM·PM)

fig. 3.18 View toward the basement from the ground floor (AM·PM)

fig. 3.19 View toward the roof light from the basement (AM·PM)

fig. 3.20 View at the middle of the staircase of the basement (AM·PM)

fig. 3.21 View toward the middle of the staircase of the basement from the basement (AM-PM)

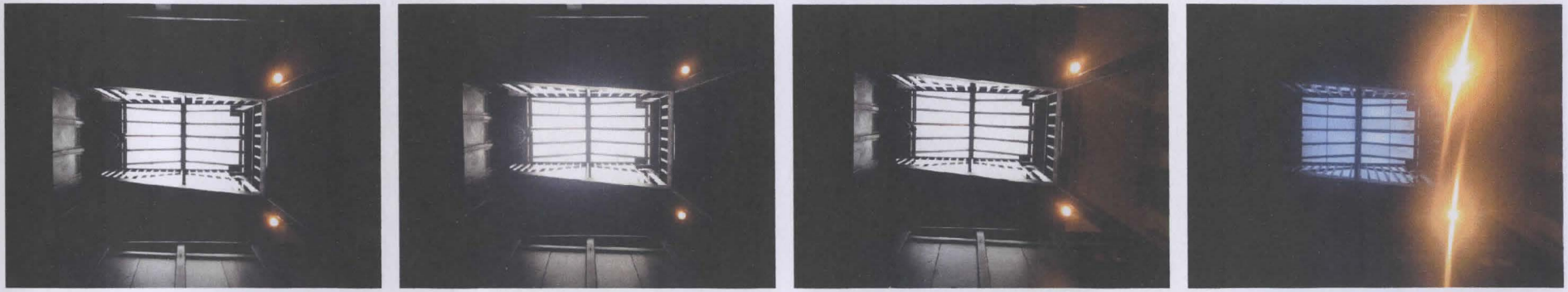


fig. 3.22 View toward the roof light from the basement (AM·PM)

fig. 3.23 View from the entrance at the ground floor (AM·PM)

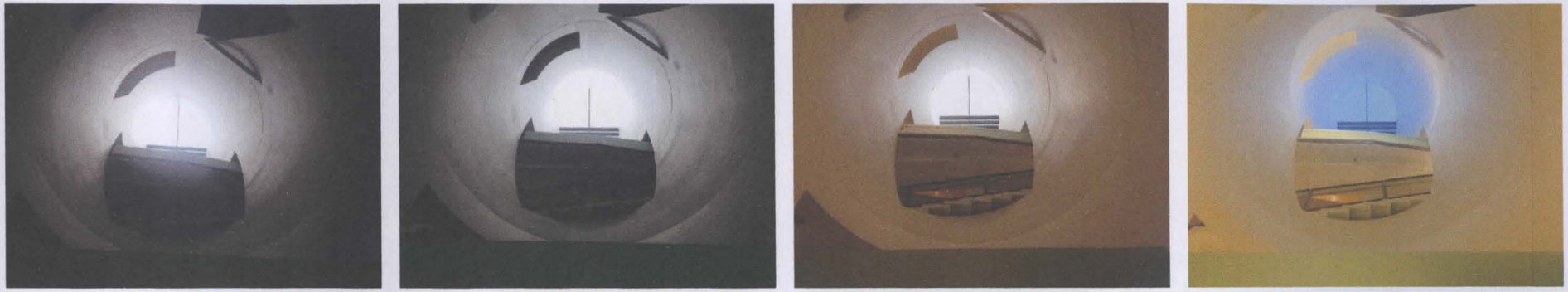


fig. 3.24 View toward the roof light from the staircase of the ground floor (AM·PM)

fig. 3.25 View toward the first floor from the second floor (AM·PM)

fig. 3.26 View at the second floor (AM·PM)

fig. 3.27 View toward the third floor from the staircase of the second floor (AM·PM)

fig. 3.28 View toward the second floor from the third floor (AM·PM)

fig. 3.29 View toward the fourth floor from the staircase of the third floor (AM·PM)

fig. 3.30 View at the fourth floor (AM·PM)

fig. 3.31 View toward the basement from the staircase of the basement (AM·PM)

fig. 3.32 View toward the middle of the staircase of the basement from the basement (AM·PM)

3.5 DISCOVERIES OF ONE DAY LIGHT

Through the experiment of one day light, I found the following common and different characteristics regarding the way to change of light in the two staircases.

As common feature of the change of the light of both staircases, people are able to experience the change of the light and the color of sky through the roof lights all day. (fig. 3.33)

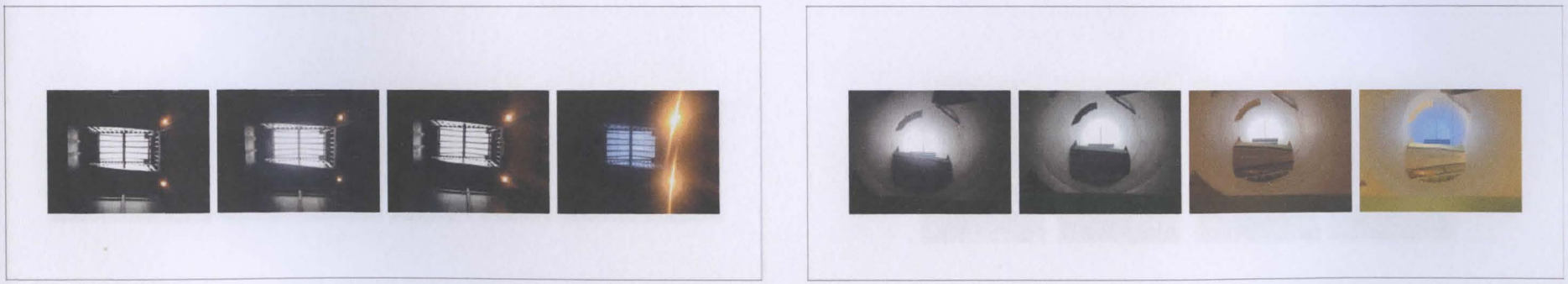


fig. 3.33 The comparison of the change of light of the roof light (left: Mackintosh building / right: Reid building)

Regarding the different features of the change of the light of the two staircases, the staircase of the basement of Reid building did not see any change of light from morning to evening compared to that of Mackintosh building. (fig. 3.34)

fig. 3.34 The comparison of the change of light in the staircase of the basement (left: Mackintosh building / right: Reid building)

In the staircase of Mackintosh building, every space was lit by the light from the roof light in the daytime, and it became dark at the evening. It shows that the light of the Mackintosh staircase follows the law of nature. (fig. 3.35)

On the other hand, the light of some parts of the staircase of Reid building does not have the relationship with the change of the natural light. Some parts of the staircase were dark without artificial light even in the daytime, or were light all day. In those spaces, people do not feel a change of natural light. (fig. 3.36)

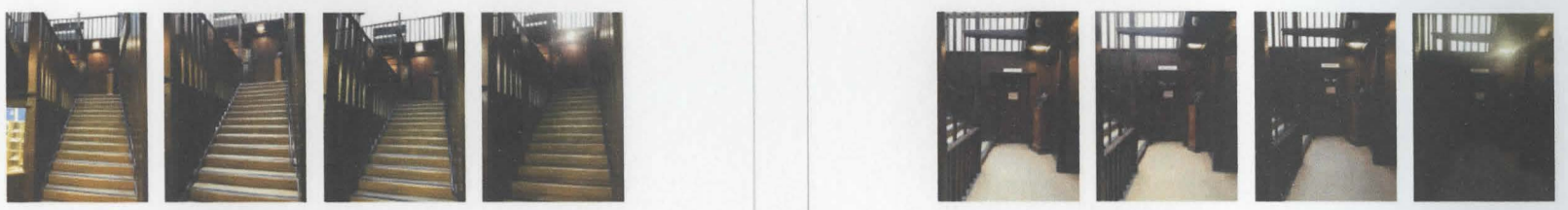


fig. 3.35 The change of light in the Mackintosh staircase (the spaces follow the change of the natural light)

fig. 3.36 The change of light in the Reid staircase (left: the space is dark at even daytime / right: the space is light all day)

When comparing the photographs that were taken at almost same time, it is clear that the light of the Mackintosh staircase followed the change of natural light, but that of Reid staircase did not follow the change of natural light. For example, the Reid staircase became suddenly dark without artificial light at the evening, while the Mackintosh staircase was still light at the same time. (fig. 3.37)

fig. 3.37 The comparison of the ways to change of light in the staircases of the Mackintosh and Reid building (left: Mackintosh building / right: Reid building)

Overall, the light of the staircases of Mackintosh building is strongly affected by the change of natural light. On the other hand, in some parts of the staircases of Reid building, the light does not have the relationship with the change of natural light, and it strongly relies on the effect of artificial light.

3.6 LIGHT MEASUREMENT

I conducted the measurement of light of the two staircases with a light meter so that I can also compare the difference of light of the two staircases from an objective viewpoint.

I conducted the light measurement from 2pm on 16 February 2014, and in the Reid building from 2pm on 9 February 2014, and both days were cloudy.

From the following page, the results of the light measurement can be seen together with visual diagrams. The results of light measurement of the Mackintosh staircase can be seen from fig. 3.38 to fig. 3.41 and those of the Reid staircase can be seen from fig. 3.42 to fig. 3.51.

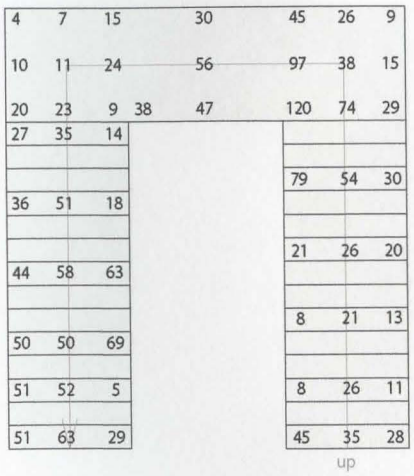


fig. 3.38 The result of light measurement (ground floor to basement) [lx]

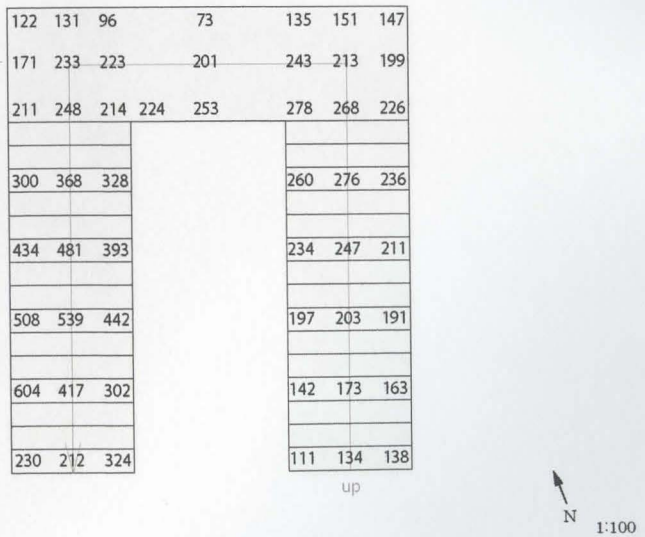


fig. 3.39 The result of light measurement (ground floor to first floor) [lx]

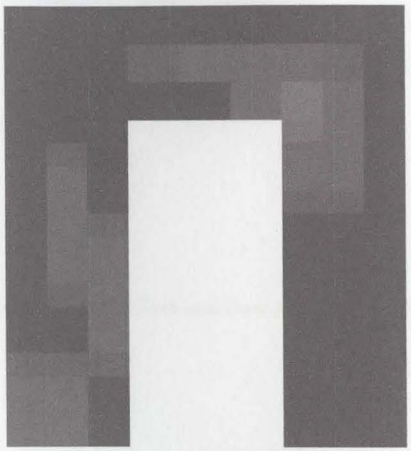


fig. 3.40 The visual diagram of the light measurement (ground floor to basement)

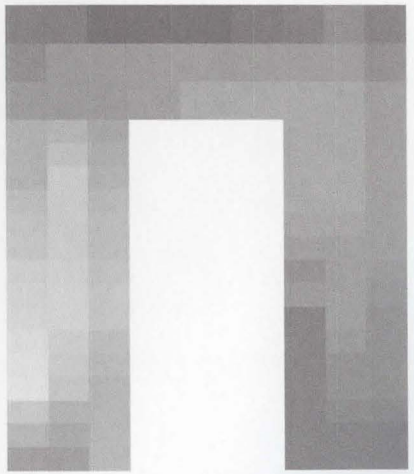
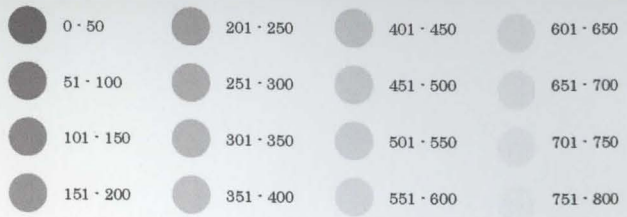


fig. 3.41 The visual diagram of the light measurement (ground floor to first floor)



Each color stands for the result of the light measurement [lx]

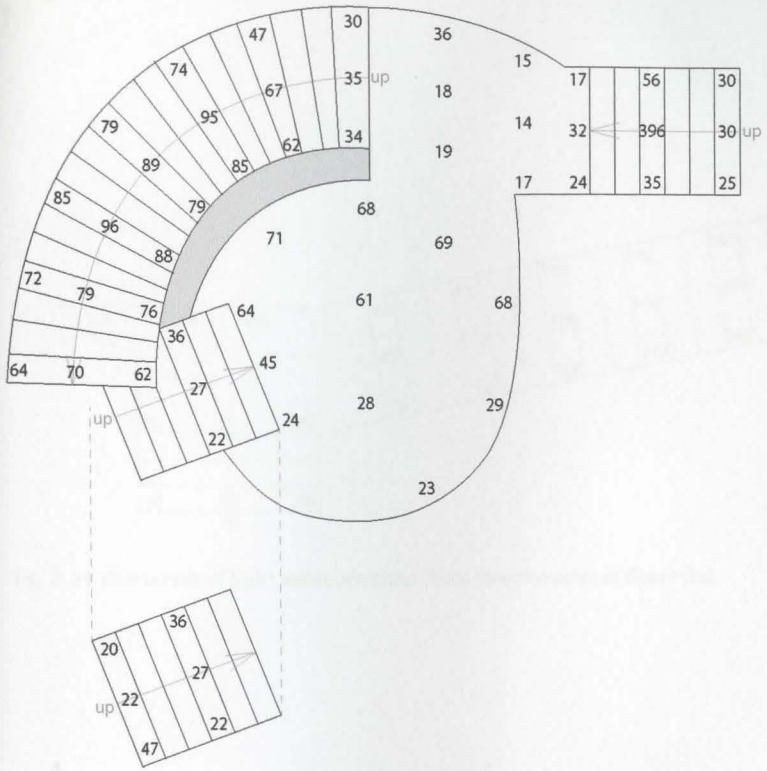


fig. 3.42 The result of light measurement (ground floor to basement) [lx]

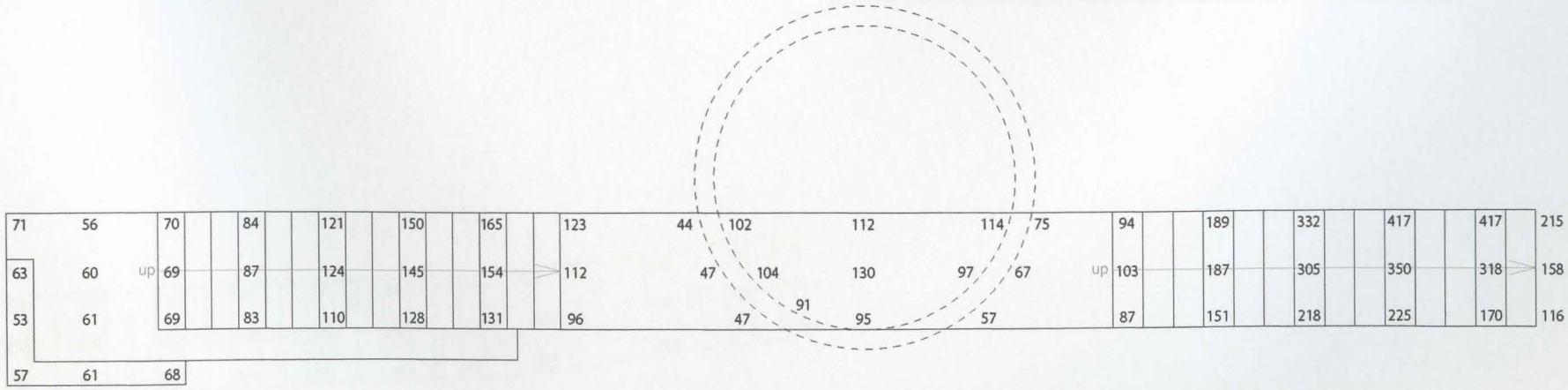


fig. 3.43 The result of light measurement (ground floor to first floor) [lx]

N

1:100

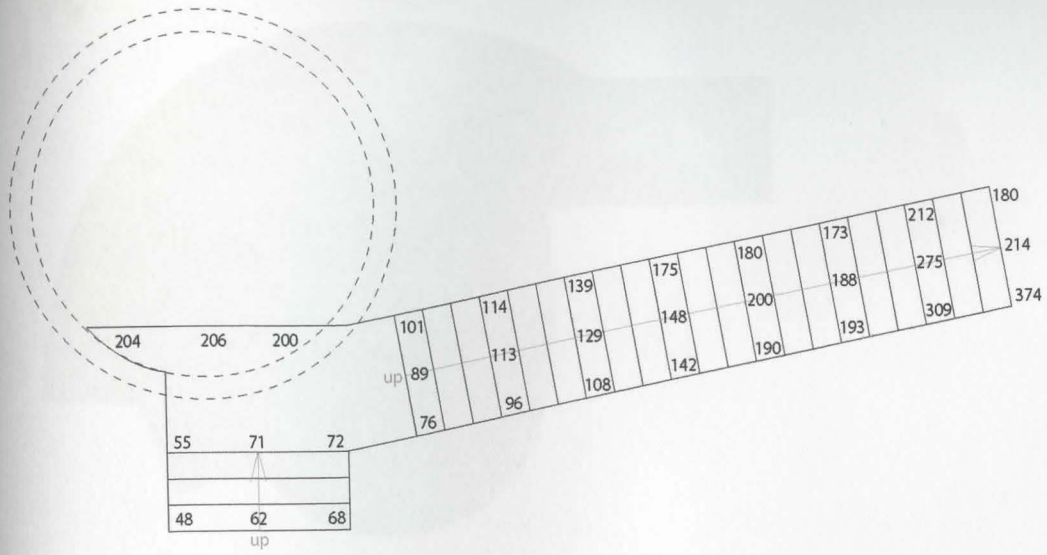


fig. 3.44 The result of light measurement (first floor to second floor) [lx]

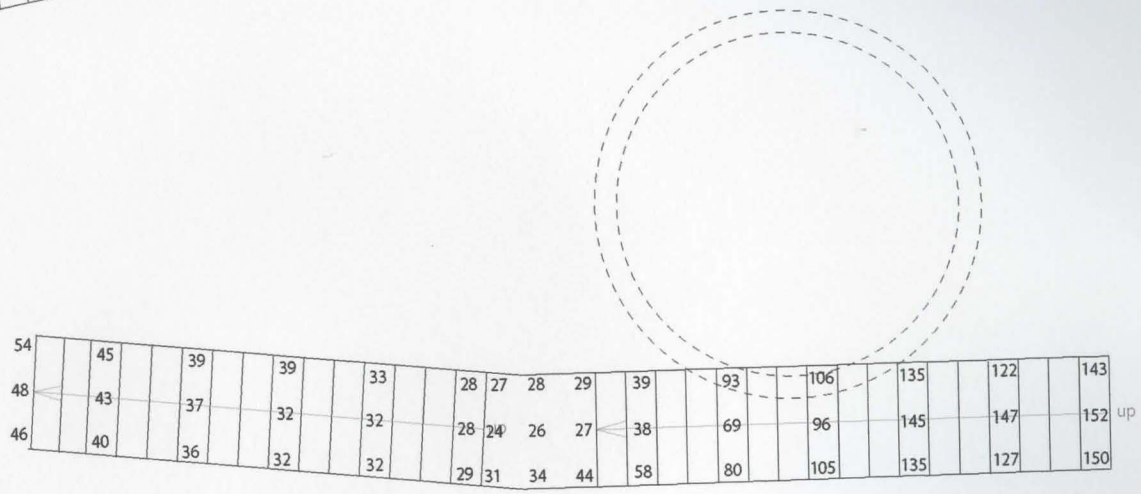


fig. 3.45 The result of light measurement (second floor to third floor) [lx]

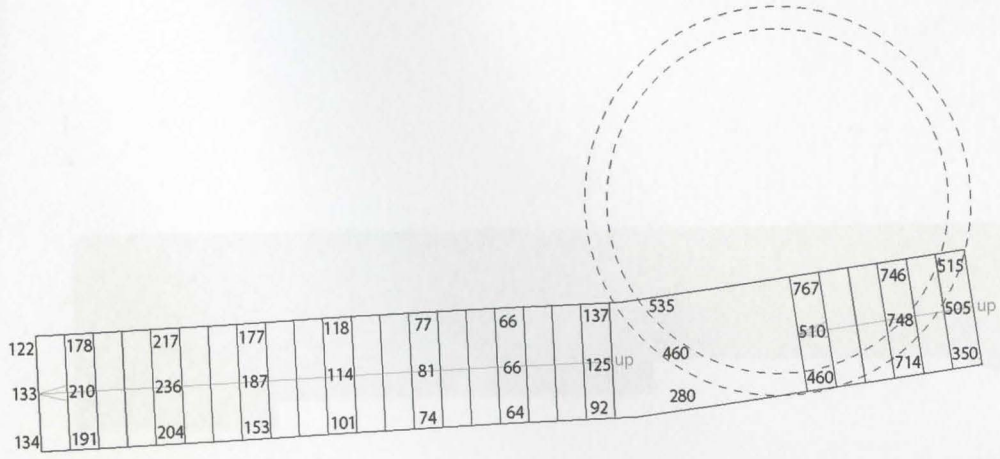
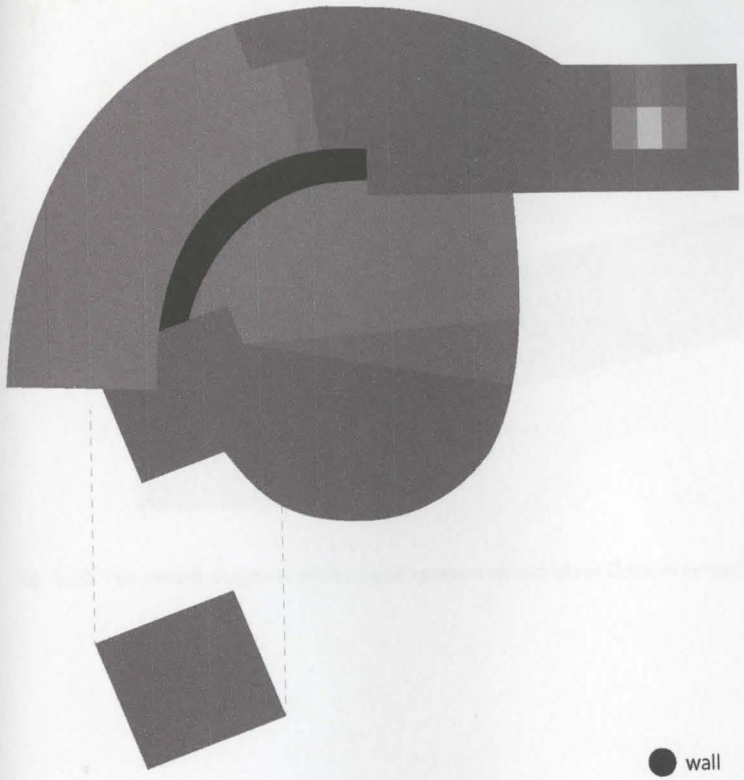
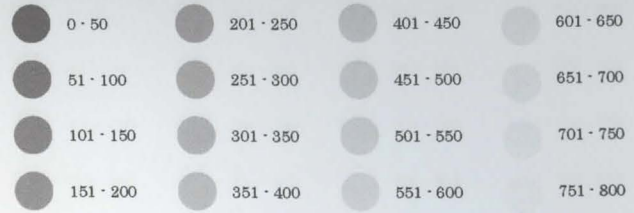


fig. 3.46 The result of light measurement (third floor to fourth floor) [lx]

N

1:100





Each color stands for the result of the light measurement [lx]

fig. 3.47 The visual diagram of the light measurement (ground floor to basement)

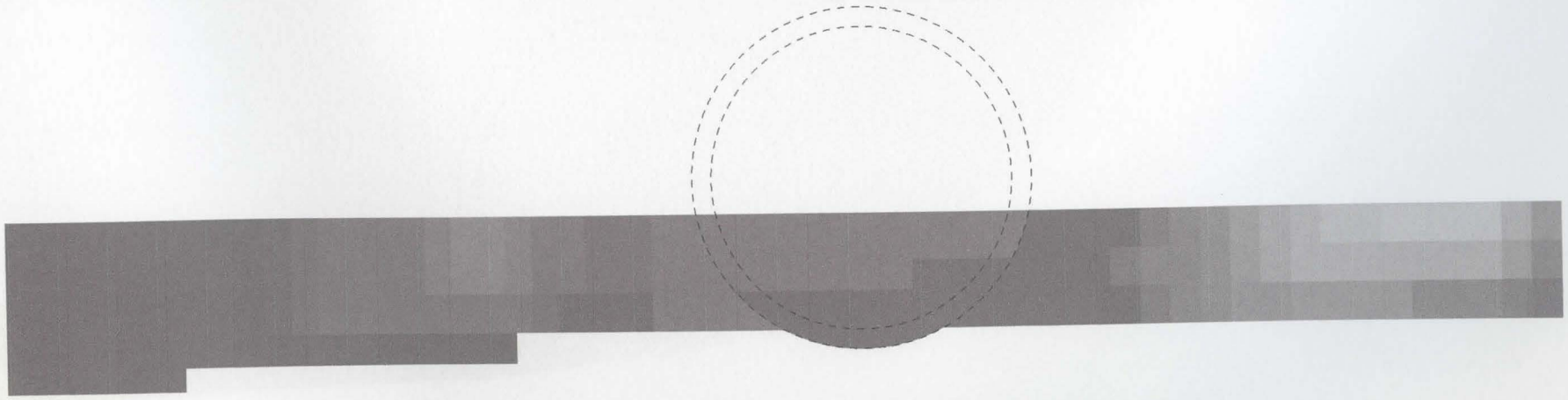


fig. 3.48 The visual diagram of the light measurement (ground floor to first floor)

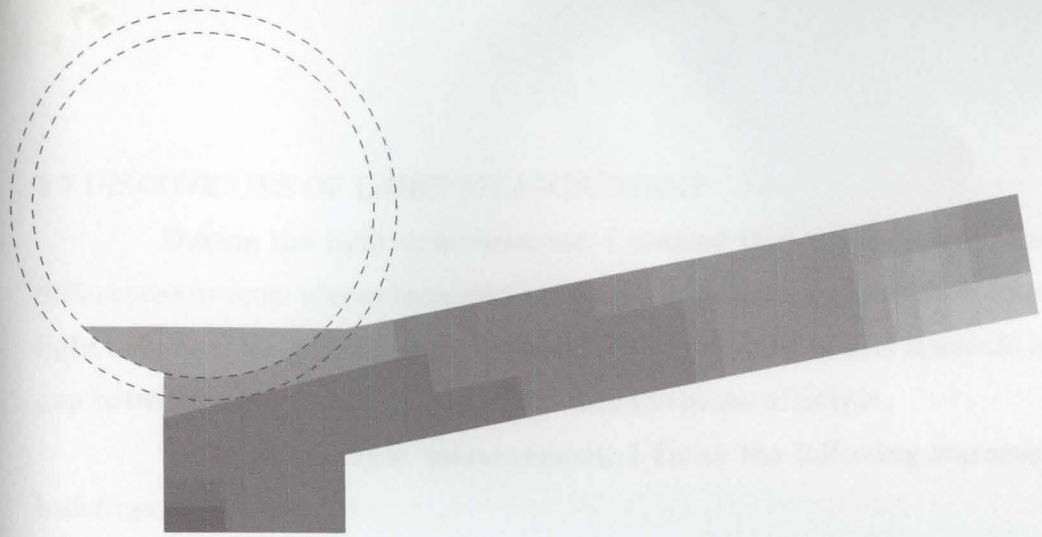
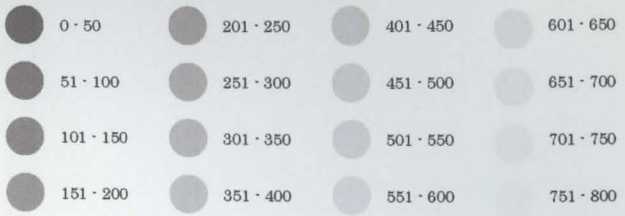


fig. 3.49 The visual diagram of the light measurement (first floor to second floor)



Each color stands for the result of the light measurement [lx]

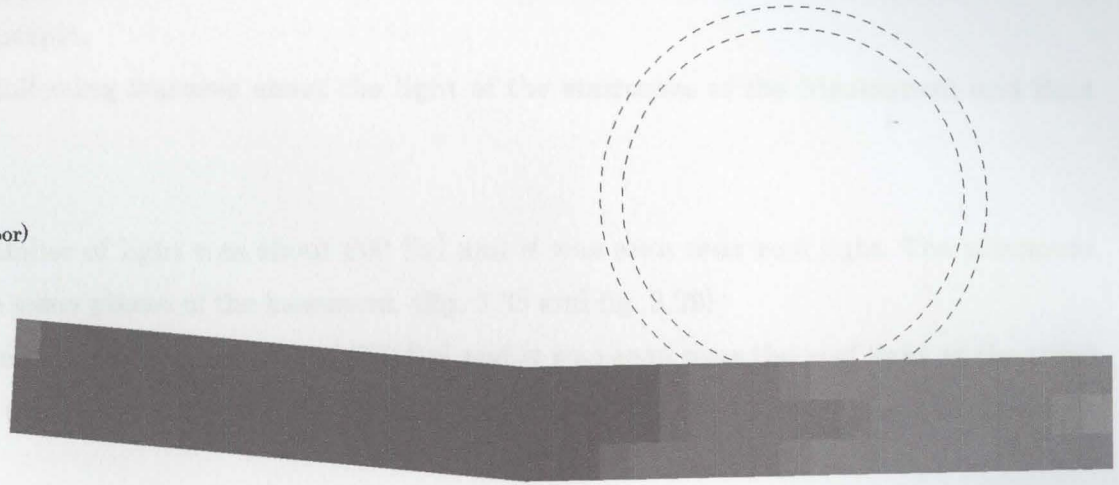


fig. 3.50 The visual diagram of the light measurement (second floor to third floor)

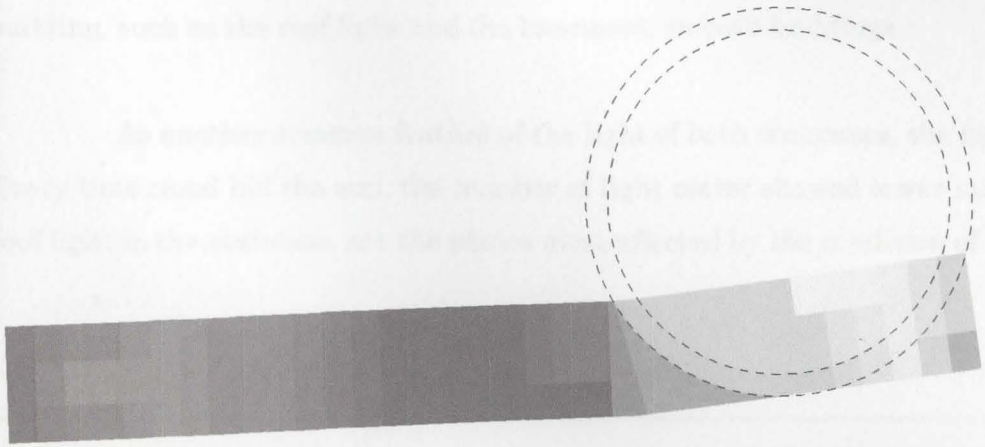


fig. 3.51 The visual diagram of the light measurement (third floor to fourth floor)

3.7 DISCOVERIES OF LIGHT MEASUREMENT

During the light measurement, I noticed that the light meter showed different numbers in each place, but I did not feel the differences in some places because the space is continuous rather than intermittent. In the sense of people, people can feel the difference of light only near a roof light or an artificial light. This means that it should be reminded that the results of the light measurement has some gap between the number of light meter and the sense of people.

Through the light measurement, I found the following features about the light of the staircases of the Mackintosh and Reid buildings.

In the Mackintosh staircase, the maximum number of light was about 600 [lx] and it was seen near roof light. The minimum number was approximately 10 [lx] and it was seen at the some places of the basement. (fig. 3.38 and fig. 3.39)

On the other hand, in Reid building, the maximum number was around 770 [lx] and it was seen near the roof light at the third floor (within the driven void light shaft). The minimum number was about 20 [lx] and it was seen at the basement same as Mackintosh building. (from fig. 3.42 to fig. 3.46)

These results show that the maximum and the minimum number of light could be seen in the almost similar function of the building, such as the roof light and the basement, in both buildings.

As another common feature of the light of both staircases, the numbers of the light meter had big fluctuation near the roof light. Every time cloud hid the sun, the number of light meter showed lower numbers right away. It means that the places, which are near the roof light in the staircase, are the places most affected by the condition of natural light.

The diagrams also show the difference of light in the two staircases. In Mackintosh building, it is obvious that the light of the ground floor is brighter than that of the basement. (fig. 3.40 and fig. 3.41) The number of light gradually continued to rise from the basement to the first floor, and created the sectional gradation, like the discovery of the sequence of light. (page 52)

In Reid building, the number of light did not increase in the upper floors unlike Mackintosh building. However, in Reid building, the number increased dramatically within the driven void light shaft or near the artificial light even in the same plane. This means that the quality of light of the driven void light shaft and that of the non-driven void light shaft are different. (from fig. 3.47 to fig. 3.51)

Overall, it could be said that the Macintosh staircase has the sectional light gradation and the Reid staircase has the planar light gradation.

CHAPTER 4 _ CONCLUSION

In this chapter, I conclude the findings on the difference between the qualities of light in the main staircases of the Mackintosh and Reid buildings through each experiment.

In the chapter 2, the pilgrimage of light enabled me to acquire knowledge of the light of European buildings. Through the pilgrimage, I found the possibility of light to remind people of a certain culture and experiences.

Based on the experience, I could categorize the experience of light of the basement staircase of Mackintosh building as the light of church/worship, and that of the ground floor staircase as the light of house within the context of the light of the European buildings. Likewise, I categorized the experience of the Reid staircase within the driven void light shaft as the light of abbey, and that of the staircase of the non-driven void light shaft as the light of house or art museum.

In the chapter 3, I found some features and differences of the quality of light of the two staircases through the following three experiments.

Through the experiment of "Sequence of Light", I found that the light of the Mackintosh staircase has a gradual change from the basemen to the first floor and it could be also said that the different kinds of banisters of each floor creates two different atmospheres within the continuous staircase. On the other hand, in the Reid building, I saw just subtle change of light due to the semitransparent banisters.

The experiment of "One Day Light" showed that people can see the change of the light and the color of sky through the roof lights in both staircases. And it also showed that the quality of light of the Mackintosh staircase is strongly affected by natural light, while that of the Reid staircase does not rely on natural light compared to the Mackintosh staircase, but rather it strongly depends on artificial light.

In the experiment of "Light Measurement", the result showed that both staircases have the maximum and the minimum number of light in the almost similar function of the buildings; the maximum number of light can be seen near the roof lights and the minimum number of light can be seen at the basement. The light measurement also made it clear that the Mackintosh staircase has the sectional light gradation and the Reid staircase has the planar light gradation.

As stated above, I was able to clarify the differences in the quality of light in the two staircases of the Mackintosh and Reid buildings. In addition to those discoveries, we can also see the difference of the meaning of each light when considering the historical background of the architectural technological advances.

As mentioned in the experiment of sequence of light in the chapter 3, Charles Rennie Mackintosh devised the banisters in the staircase of the ground floor and the basement, and created the space that produces two different atmospheres with using only the light from the roof light. This means that Charles Rennie Mackintosh tried to overcome the limitation of the structural technology, which was the masonry construction at that time, and sought for the possibility of light.

On the other hand, the experiment of light measurement showed that there are the two different qualities of light in the Reid staircase, which are the light of the driven void light shaft and the light of the non-driven void light shaft. I believe that the light of non-driven void light shaft expresses the thought that we can easily acquire light by utilizing modern architectural technology compared to the past and even in Glasgow where the climate is not in good condition. In the staircase of the driven void light shaft, where it is filled with changing light all day, it seems that the light tries to show the comfort of light to people. It can be also interpreted in such a way that the light tries to tell the comfort and appreciation of light to people who are familiar with the plenty of light of modern architecture now.

As described above, the light designed by Charles Rennie Mackintosh expresses the challenge toward the limitation of structure,

while the light designed by Steven Holl expresses the massage that we have to retain our precious spirit and senses even if we have the modern technological advances.

POSTSCRIPT

Finally, I state my findings through this dissertation. I tended to note the aspects of architecture that easily appear in the media, such as a concept (word) or a form (photograph) until I engaged myself in this research project. However, I changed my viewpoint about architectural perspectives due to the experiences and observations of various types of light.

I then realized that the real architectural space does have diverse characteristics and the quality of the space is always changed by light. In that way, the space seems to be not just a product, but a living thing.

This dissertation tells and reminds me that there are a lot of beautiful living spaces in the world. I would like to meet more living spaces and create my own living spaces.

Bibliography

1. Boal, Emma. Light and dark: architectural atmosphere, Mackintosh School of Architecture 1981. Glasgow: The Glasgow School of Art, 2012.
2. Buchanan, William. Mackintosh's masterwork: the Glasgow School of Art. Edinburgh: GSA Enterprises Limited, 1994.
3. Chen, Haohao. The role of light in architecture: exploration and manipulation of light from 1950s to 2000s. Glasgow: Glasgow School of Art 1981, 2011.
4. Coltart, William A. A detailed measured study of the Glasgow School of Art. Glasgow: Mackintosh School of Architecture, 1982.
5. Crawford, Alan. Charles Rennie Mackintosh. London: Thames and Hudson Ltd, 1995.
6. Descottes, Herve and Ramos, Cecilia E. Architectural Lighting: Designing with Light and Space. New York: Princeton Architectural Press, 2011.
7. Gasol, Ivet. 158-168 Renfrew Street: the new redevelopment of the Glasgow School of Art. Glasgow: Mackintosh School of Architecture, 2012.
8. Hawkes, Dean. The Environmental Imagination: Technics and politics of the architectural environment. Wiltshire: Taylor & Francis Group, 2008.
9. Holl, Steven. COLOR LIGHT TIME. Freiburg: Lars Muller Publishers, 2012.
10. Holl, Steven. The Glasgow School of Art Design Statement. Glasgow: 2010.
11. Jamieson, Bruce N. The Glasgow School of Art Centenary: a history of its immediate context. Glasgow: Mackintosh School of Architecture 1981, 1996.
12. Macaulay, James. Glasgow School of Art: Charles Rennie Mackintosh. London: Phaidon Press Limited, 1993.
13. Platt, Christopher and Carter, Brian. Uneasy Balance. Glasgow: The Mackintosh School of Architecture, 2013
14. "Kenchikuka Jr-blog". Ken-Architects. Accessed 31 March 2014. http://kenarchitects.blog.shinobi.jp/Category/5/4/